ECHNOLOGY DEPARTMENT

33rd Year

AUGUST, 1949

RUBBER AGE

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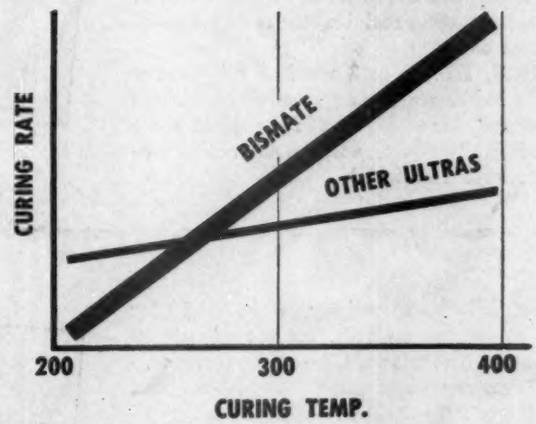
DETROIT

BISMATE

THE ACCELERATOR FOR HIGH SPEED
CURES AT HIGH TEMPERATURES

BISMATE* PROCESSES SAFELY



* RODFORMED

BISMATE permits C.V. units to be speeded up thus increasing production and lowering costs.

R. T. VANDERBILT CO. INC.

230 Park Avenue, New York 17, N. Y.

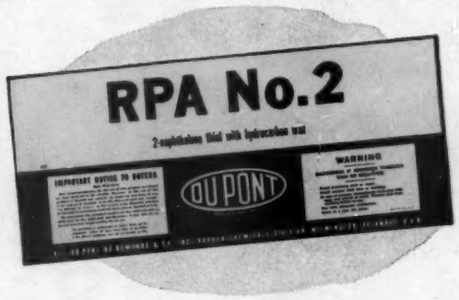
With DU PONT RPA's you can

- *Reduce breakdown time*
- *Improve processability*
- *Cut power consumption*

RPA #2 SOLID FORM

For natural rubber and reclaim

Supplied in the form of waxy flakes, it is especially suited to open mill breakdown of natural rubber. Its use materially reduces the time and power required for breakdown. From 0.15 to 0.50 part per 100 parts of rubber is recommended, depending on the time and temperature of milling. RPA No. 2 also aids in producing smooth-processing reclaim stocks . . . is effective for reducing the viscosity of rubber cements.

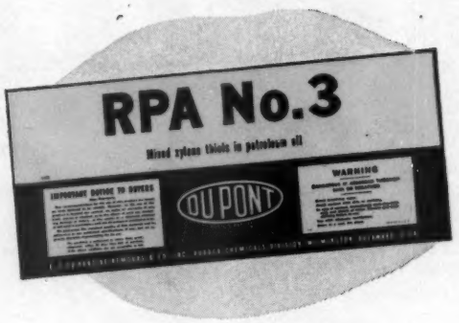


RPA #3 LIQUID FORM

For natural rubber and reclaim

Preferred for peptizing natural rubber in a Banbury or plasticator because of its liquid form. With this peptizer, it is often possible to eliminate the second pass usually required when plasticating by mechanical means alone. The recommended amounts are the same as for RPA No. 2. It also helps produce smooth-processing reclaim stocks and aids in reducing the viscosity of rubber cements.

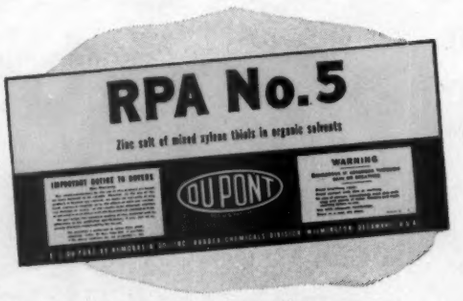
In "low temperature" GR-S, RPA No. 3 markedly improves processability . . . results in lower processing temperatures, less scorching, smoother extrusions. Concentrations of 1.0 part or more are generally recommended. Equally effective in the above applications is RPA No. 3 RO, a reodorized material.



RPA #5 LIQUID FORM

For GR-S—Especially developed for breaking down GR-S. Its use effectively reduces breakdown time and power consumption . . . helps produce smoother processing stocks with reduced nerve and shrinkage. From 0.5 to 2.0 per cent RPA No. 5 is recommended for breakdown at high temperatures on a mill, or in a Banbury or plasticator.

For sample and additional information on Du Pont Rubber Peptizing Agents, write: E. I. du Pont de Nemours & Company (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.



DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.),
Wilmington 98, Delaware

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

THE RUBBER AGE, published monthly by the Palmerton Publishing Co., Inc., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered as second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. August, 1949, Vol. 65, No. 5.

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DETROIT

Dutro Cushioned Floor Mat, made by Dutro Company, Oakland, California.

It puts a cushion under foot—lowers expense too!

THESE floor mats used to lead a rough, and often a short life. The rubber binding strips on the underside wouldn't stand up under hard usage—as well as the effects of oil, grease or acid.

The makers of Dutro Cushioned Floor Mats, after tests of many rubber compounds, found that Hycar American rubber not only solved the problems, but gave them *extra* advantages.

For example, mats have been in use for three years and Hycar is still doing a first-rate job! It acts as a resilient cushion—helping reduce worker fatigue. Mats do not come apart or stretch out of shape. They protect dropped tools and parts.

These floor cushions are paying for themselves many times over in machine shops, canneries, restaurants, locker rooms and other "problem spots" where service conditions are severe.

Hycar American rubber set the pace here, as it has in so many other products, because of its versatility. It resists heat and cold, weather and wear. It's light in weight, has high tensile strength, is highly resilient. It's oil-resistant—gas-resistant. Compounds can be varied from extremely soft to bone hard, and can be made in many colors.

Hycar
Reg. U.S. Pat. Off.
American Rubber

Besides being a base material, Hycar may be used as a plasticizer . . . as a modifier for phenolic resins . . . as an adhesive . . . as a latex for coating or impregnating.

Hycar is used in practically every field, in dozens of ways. Perhaps it may answer your problem—improving a product or developing a new one. For complete information and helpful service, please write Dept. HB-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Philliloo—*Clamor*

Philblack* A—*The HMF black that always gives an exceptional performance!*

PHILBLACK A raised the curtain on a new era in carbon blacks. And the applause was thunderous for many reasons.

Philblack A incorporates *fast* . . . cuts processing time. When it comes to extrusions, this HMF black gives beautiful results. Moldings are clean, smooth and glossy. Uniformity of production helps keep costs low.

In heavy duty tire carcasses, Philblack A really stars because its excellent heat conductivity helps maintain low sidewall temperatures.

Initial orders for Philblack have been followed by thousands of encores. For stellar performance of your own rubber products reinforce with Philblack A.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

Warehouses in Akron, Boston, Chicago and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

A Trade-Mark.

Pick your package—

PLIOLITE S-6 comes the way you want it

As one more service to its customers—Goodyear supplies **Pliolite S-6** in a choice of easily-handled packages. **Pliolite S-6** comes in 200-pound drums or in 50-pound bags, so you can request this use-proved copolymer in whichever container best meets your handling facilities.

Either way you order, you'll find **Pliolite S-6** can be easily dispersed in the Banbury or on the mill. Or if you wish you can have **Pliolite S-6** *as masterbatch* — a thorough dispersion of the resin in rubber, packed in 200-pound cartons.

Regardless of the form of **Pliolite S-6** you order, when you include it in your gum, black or non-black loaded stocks, this copolymer resin will improve tensile, tear, hardness, stiffness, flex-life and abrasion resistance. Whenever you want a low-gravity, light-colored stock of high strength and easy processability, you can use **Pliolite S-6** with confidence. For details and sample, write:

GOODYEAR, CHEMICAL DIVISION
AKRON 16, OHIO

USE PROVED *Products*

GOODYEAR

Pliolite—T. M. The Goodyear Tire & Rubber Company

PRODUCTION BENEFITS

- ☐ Perfect Separation of Stock and Liner
- ☐ Less Power and Labor
- ☐ Horizontal Storage, if desired
- ☐ No Cleaning of Liners
- ☐ Longer Liner Life
- ☐ Less Stock Losses

BENEFITS TO STOCKS

- ☐ No Lint or Ravelings
- ☐ Oxidation and Bloom Prevented
- ☐ Air, Moisture & Sunlight Excluded
- ☐ Tackiness of Stock Preserved
- ☐ Gauges More Easily Maintained
- ☐ Greater Latitude in Compounding

Check these Important Advantages of

CLIMCO Processed Liners

These advantages are not mere claims, but have been demonstrated over and over by the use of Climco Processed Liners in all kinds of rubber plants during the last 27 years. Surely, in the interests of better production at less cost, Climco Liners are worthy of use in your plant.

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

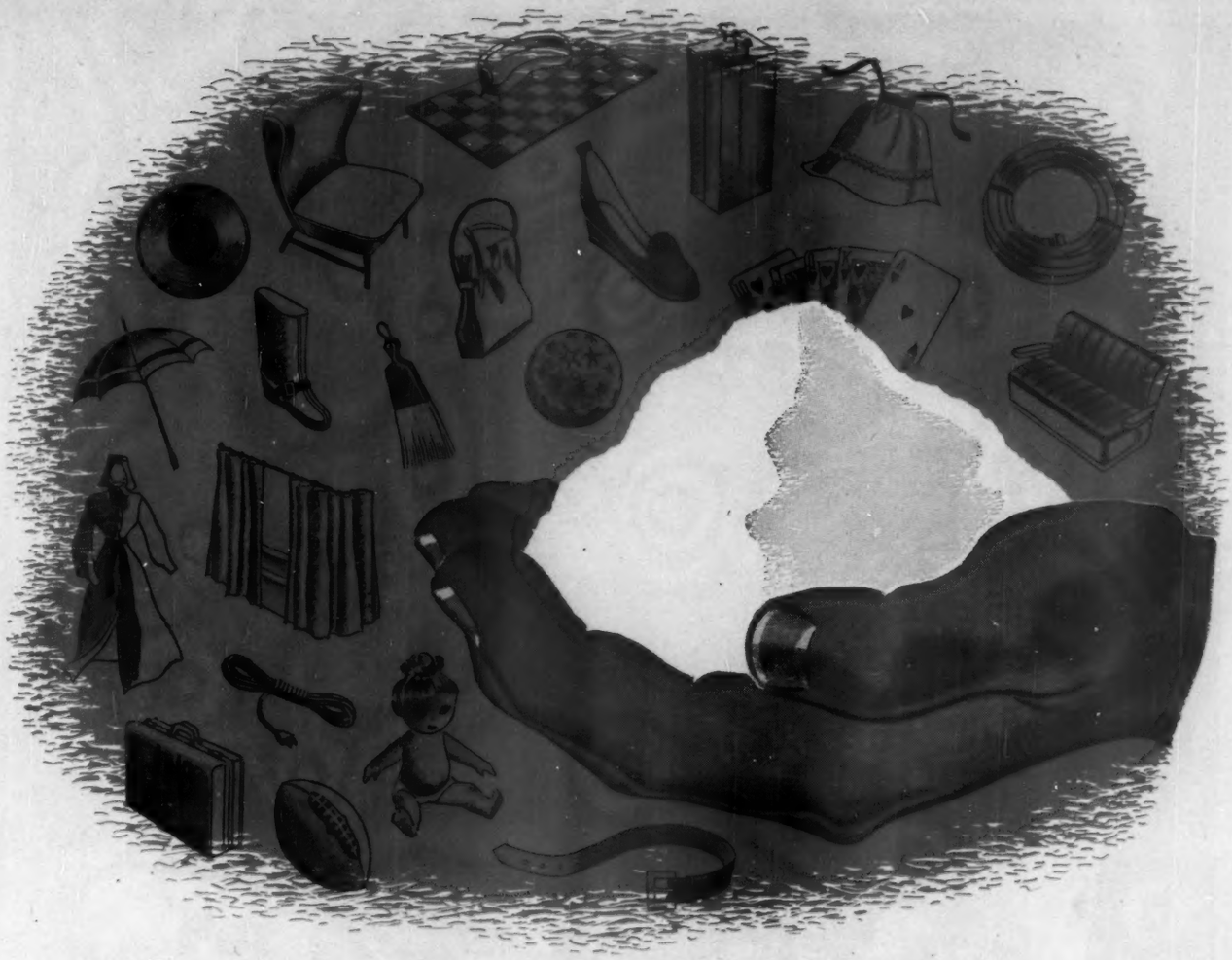
THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 4, Ohio, U. S. A.
Cable Address: "BLUELINER"

CLIMCO

PROCESSED LINERS

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

SERVING THE RUBBER INDUSTRY FOR 27 YEARS



Tests show Marvinol® saves time... improves quality in making plastics

In laboratory tests and production runs, Marvinol vinyl resins are proved time-savers due to shorter pre-mix, open mill and Banbury cycles . . . faster extrusion cycles.

IN ADDITION TO TIME-SAVINGS in processing, Marvinol offers many important benefits to processors, fabricators, marketers and consumers. Products based on Marvinol vinyl resins have greater flexibility at low temperatures . . . less deformation due to heat. They're extra tough, dry and pleasant to touch. They resist oils, acids, wear, tear and abrasion.

High processability spreads these benefits to many varied fields, for Marvinol can be calendered, extruded, injection-molded or dispersed for coating and slush molding . . . in rigid, semi-rigid or elastomeric formulations . . . Test this remarkable vinyl polymer. Chances are, if you're a processor, it will pay you in time-savings and quality . . . and if you make end products it will increase the salability of your merchandise.

The entire efforts of our modern development laboratories are for our customers' benefit. All the formulation, compounding and processing information developed here is at your disposal since it is only through you that Marvinol-based products reach the consumer market. Write to Chemicals Division, Dept. R-8, THE GLENN L. MARTIN COMPANY, BALTIMORE 3, MARYLAND.

Marvinol's extra toughness and dryness make plastics products more durable with a surface that's pleasant to touch.

• • •

Marvinol's greater flexibility in low temperatures pays off in products subjected to severe exposure and cold weather during shipping or use.

• • •

Superior dimensional stability makes Marvinol vinyl resin an ideal raw material for products that must not shrink or deform under heat and time.

Martin® Marvinol

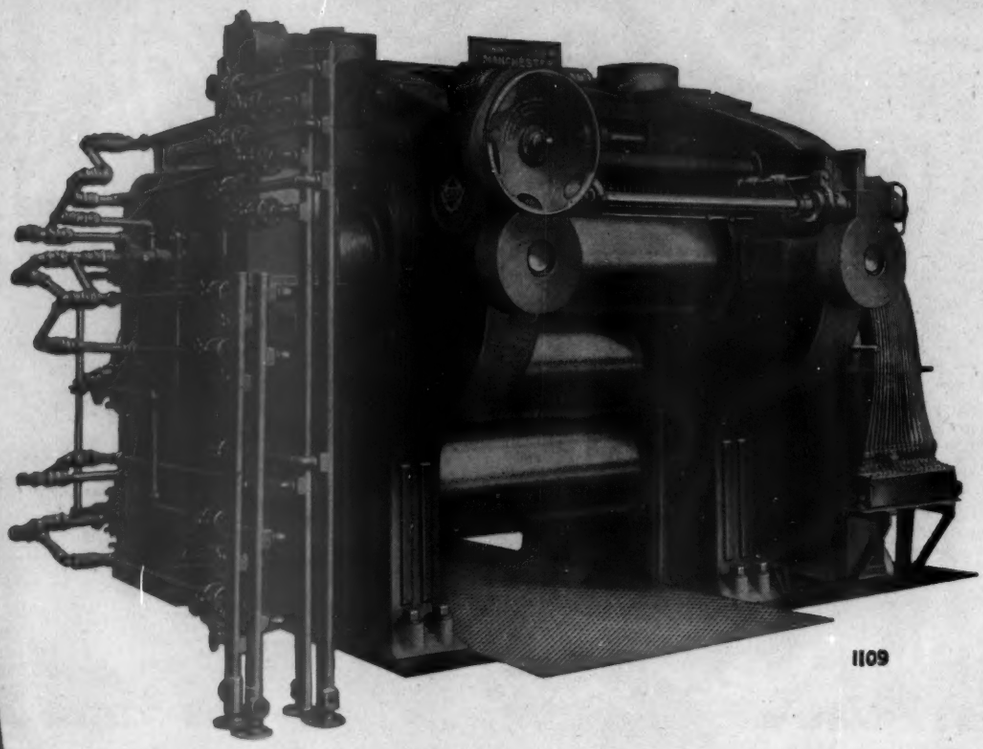
RESINS, PLASTICIZERS AND STABILIZERS PRODUCED BY THE CHEMICALS DIVISION OF

THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION

"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"

MANUFACTURERS OF: Dependable Martin 2-0-2 airliners • Advanced military aircraft • Revolutionary rockets and missiles • Electronic fire control systems • Versatile Marvinol resins (Martin Chemicals Division) • **DEVELOPERS OF:** Marang fuel tanks (licensed to U. S. Rubber Co.) • Stratovision aerial rebroadcasting (in conjunction with Westinghouse Electric Corp.) • Honeycomb construction material (licensed to U. S. Plywood Corp.) • New type hydraulic automotive and aircraft brake • Permanent fabric flameproofing • **LEADERS IN RESEARCH** to guard the peace, build better living in far-reaching fields.

CALENDERS OF MERIT



1109

The Calender shown has four rolls 68" long by 24" diameter, arranged to give even or friction speeds. The off set, top and bottom rolls can be adjusted by motor or by hand. Oil lubrication is provided from the oil pump to all parts which run continuously. Grease gun lubrication is provided to the more static moving parts. Where high temperatures are used for plastic materials our calenders are equipped with flood lubrication to the bearing blocks.

We supply the auxiliary equipment such as warmers, drying and cooling drums, batch-up and let-off gear, etc

FRANCIS SHAW & CO. LTD. MANCHESTER II ENGLAND

R 163

CHEMIGUM *in molded products*

For greater oil resistance

use CHEMIGUM

PROVED in the petroleum industry — where oil resistance of rubber is a major problem — **Chemigum,** Goodyear's acrylonitrile rubber, is available in three types, each with specific properties:

Chemigum N-3-NS has higher acrylonitrile content, combining excellent oil resistance with easy processability.

Chemigum 30-N-4-NS is a softer rubber ideally suited for extrusions.

Chemigum 50-N-4-NS is a tougher rubber designed for such items as molded products.

All three forms of **Chemigum** have highly desirable physical properties, excellent oil resistance, low swell in aromatic solvents. They are well stabilized against effects of light and age with non-staining anti-oxidants which permit their use in light-colored stocks. Easily processed, all three are compatible with vinyl resins and can be used to replace and extend plasticizers.

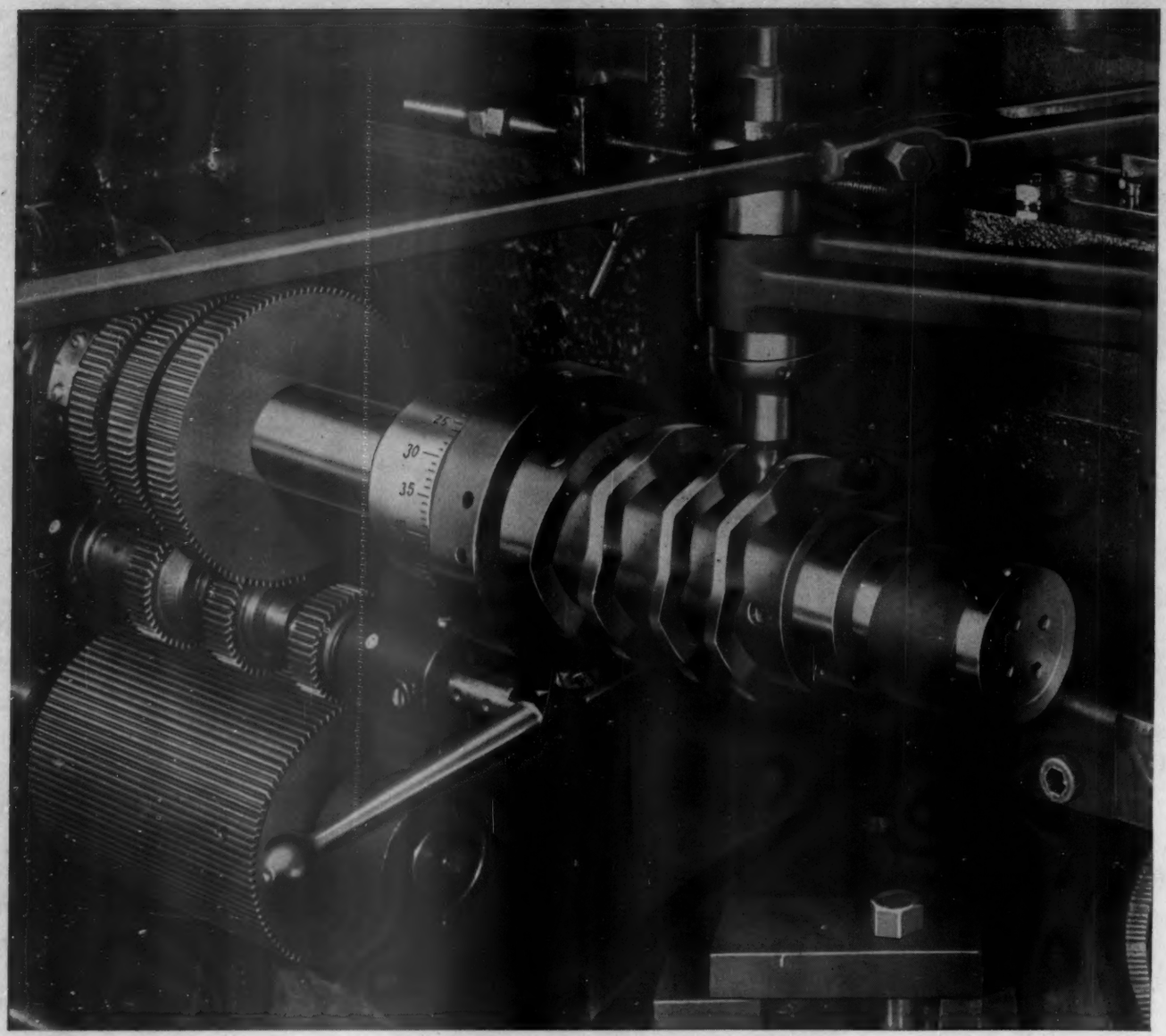
For details and samples, write:

Goodyear, Chemical Division,
Akron 16, Ohio.

USE PROVED *Products*

GOODYEAR

Chemigum—T.M. The Goodyear Tire & Rubber Company



WHY VARIABLE PITCH MOLDS NO LONGER COST A PREMIUM

UNTIL the development by BRIDGWATER of the transmission shown above, engraved tire molds of the variable pitch type were substantially more expensive than molds of a uniform pitch.

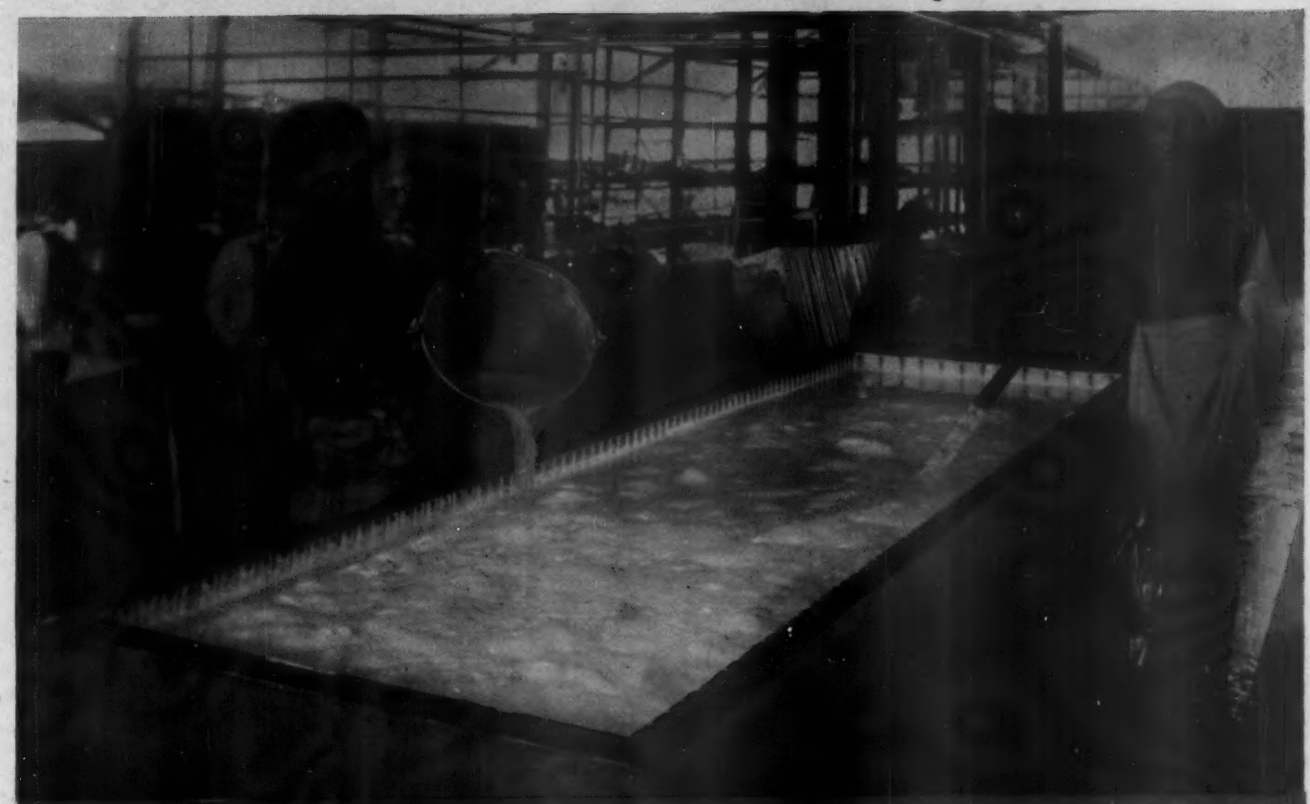
This ingenious unit is a special attachment we use on our BRIDGWATER MOLD ENGRAVING MACHINES*. By shifting the gear lever to any one of three different positions, a long, short or medium pitch may be cut with unfailing accuracy and at a cost essentially no greater than cutting a uniform pitch . . . just another example of our determination to make molds of whatever characteristics the tire industry requires . . . at the lowest possible cost.

* Designed and built by Bridgwater and used by leading mold makers the world over.

THE BRIDGWATER MACHINE COMPANY

Akron, Ohio

FOR BETTER MOLDS FOR BETTER TIRES *SPECIFY* BRIDGWATER



Scene at Tebah Merlimau Estate, Melaya, showing Pepton 22 dispersion being added to natural rubber latex before adding coagulant.

Pepton*22 Plasticizer

CUTS BREAKDOWN TIME AT LEAST 50%

May be added to the latex at the plantation

When you use natural rubber which has had Pepton 22 Plasticizer added to the latex prior to coagulation, you enjoy all its benefits and are saved an extra step in the compounding room.

Use of Pepton 22 reduces the amount of mastication required to achieve the desired plasticity by at least 50%. Pepton shows considerable action at temperatures as low as 212° F. but exerts its best effect at temperatures above 240° F. Pepton 22 also improves processing qualities and has no effect on the physical or aging characteristics of the rubber.

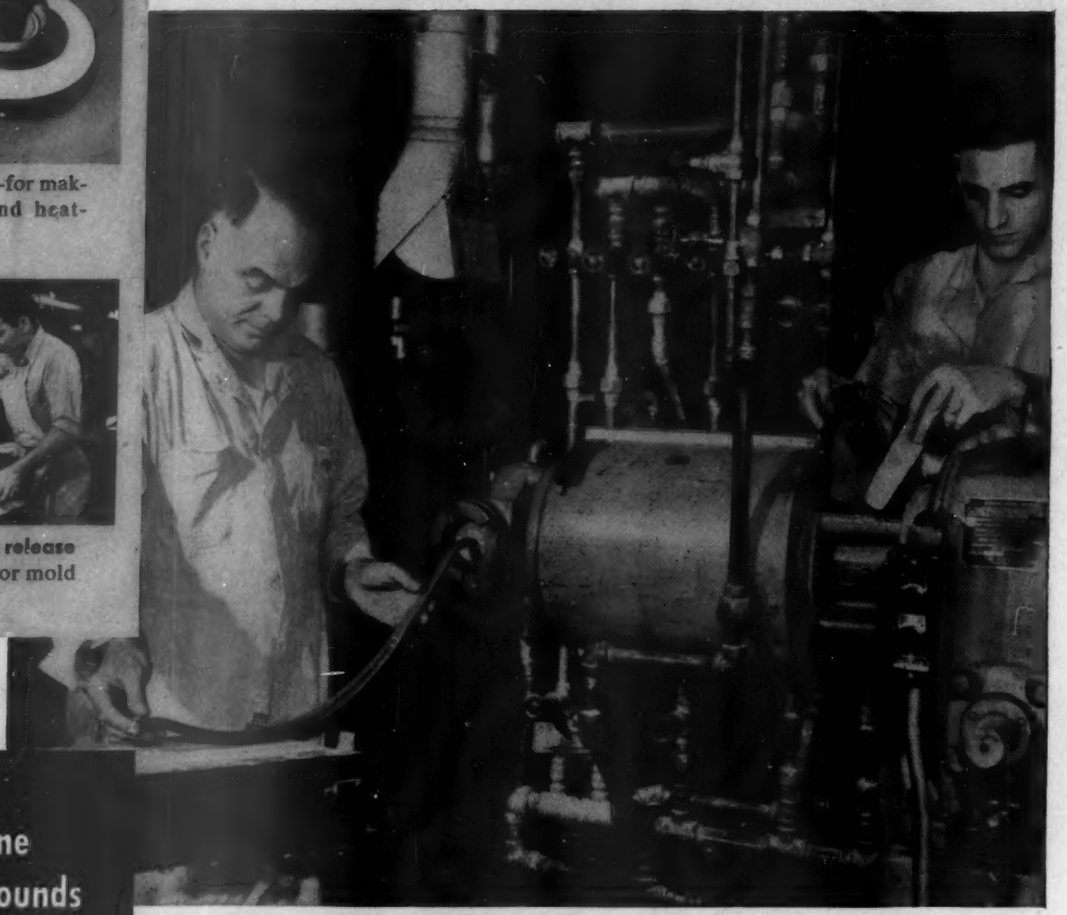
*Reg. U. S. Pat. Off.

AMERICAN *Cyanamid* COMPANY
CALCO CHEMICAL DIVISION
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

Calco

G-E silicone gum—for making chemical- and heat-resistant rubber.

G-E silicone mold release agents—for superior mold lubrication.



Fabricators find General Electric silicone compounds give excellent flow, easy handling, and short molding cycle for molding and extruding operations.

How G-E silicone rubber compounds can increase your sales

Interested in new business? Then you'll want to investigate G-E silicone rubber compounds.

These remarkable silicone-formulated compounds permit you to extrude dozens of profitable items impossible to make with ordinary rubber. Producing parts which are chemically inert, temperature-resistant, and flexible, these compounds offer rubber molders the chance for many interesting new sales outlets.

The variety of G-E silicone rubber compounds available enables you to obtain a wide range of hardness and elongation properties. You'll find them easy to handle, too, for they flow smoothly, require a short molding cycle, and hold their uncured shape. These materials can be extruded and transfer-molded or compression-molded.

Other G-E Silicone Products

If you're interested in making your own compounds, General Electric silicone gum is available for that purpose. And for synthetic or natural rubber stocks, you can depend on General Electric silicone mold lubricants to give you quick, easy release, particularly with intricate moldings.

For information on how G-E silicones can help you increase sales, cut costs, and improve your products, write to Section 41-8, Chemical Department, General Electric Company, Pittsfield, Mass.

GENERAL ELECTRIC

CD45-8L6

SILICONES for Industry

CRYSTEX

INSOLUBLE SULPHUR

An Amorphous Sulphur Prepared Especially to Prevent Bloom in Uncured Rubber Stocks

CRYSTEX Insoluble Sulphur 99.5% pure (85% insoluble sulphur content) can be used straight or blended. Use straight for maximum control of sulphur blooming. Blend with Flowers of Sulphur (which normally tests 30% insoluble sulphur) to a lower insolubility where economy is a factor.

Repair stocks and all stocks that are to remain in the uncured state for any prolonged period need straight CRYSTEX without blending. Tire carcass stocks that normally reach building operation promptly may not require the full 85% insolubility of CRYSTEX. In mechanicals, building quality and freedom from mold blemishes are obtained when CRYSTEX is employed.

Why not check the current low price of CRYSTEX Insoluble Sulphur? The chances are you can use CRYSTEX advantageously in your operations.

Stauffer CHEMICALS SINCE 1885

OTHER RUBBERMAKERS' CHEMICALS

Commercial Rubbermakers' Sulphur, Tire Brand, 99½% Pure

Refined Rubbermakers' Sulphur, Tube Brand

"Conditioned" Rubbermakers' Sulphur

Carbon Tetrachloride

Carbon Bisulphide

Caustic Soda

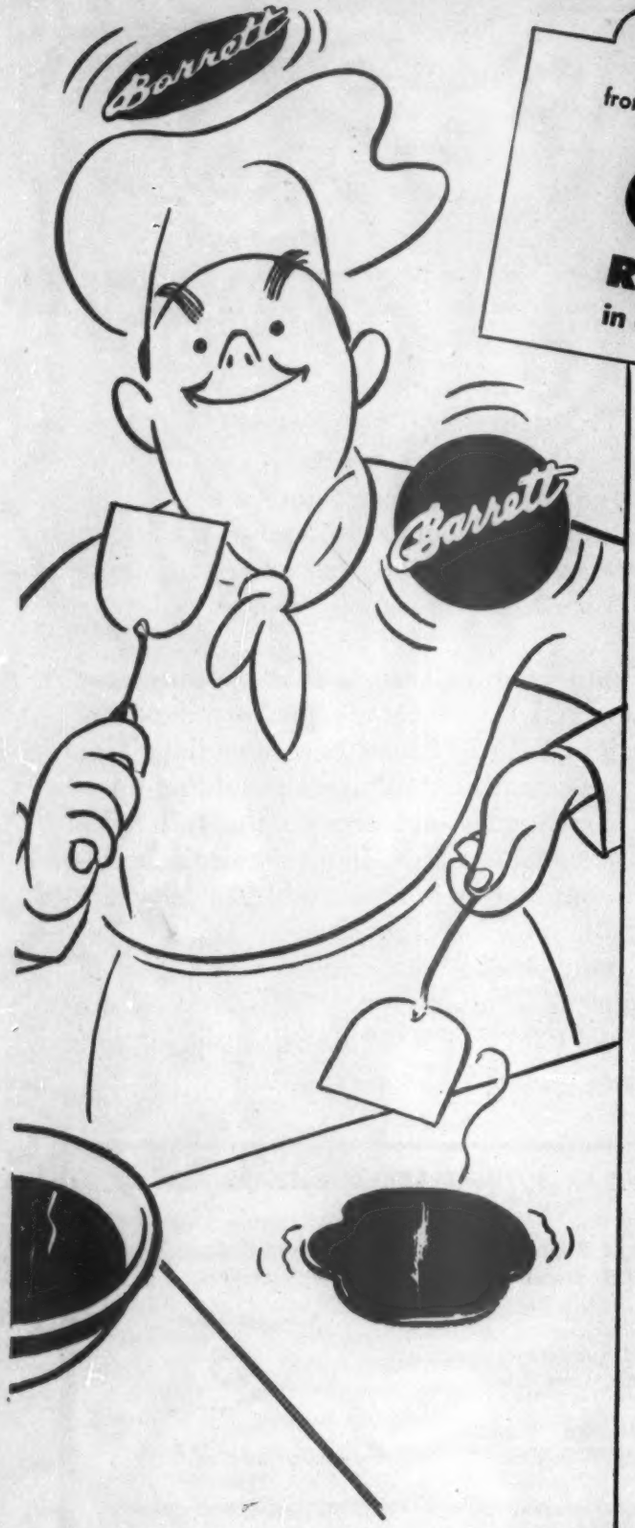
Sulphur Chloride

Flowers of Sulphur 99½% Pure (30% Insoluble Sulphur)

Stauffer **CHEMICAL COMPANY**

420 Lexington Avenue, New York 17, N. Y.

221 North LaSalle St., Chicago 1, Illinois
555 South Flower Street, Los Angeles 13, Cal.
636 California Street, San Francisco 8, Cal.
424 Ohio Building, Akron 8, Ohio
Apopka, Fla. — N. Portland, Ore. — Houston 2, Tex. — Weslaco, Tex.



RECIPE

from the Barrett Rubber Research Laboratory

FOR

CUMAR*

RESIN, EX GRADE

in a Natural Rubber: GR-S Blend

RECIPE		
Smoked Sheets	65.00	65.00
GR–S 17	35.00	35.00
"CUMAR" Resin, EX Grade	....	15.00
Calcium Carbonate (Precipitated)	150.00	150.00
Zinc Oxide	5.00	5.00
"LAUREX"	2.00	2.00
"AGERITE ALBA"	1.00	1.00
Paraffin	2.00	2.00
Sulfur	2.50	2.50
Benzothiazyl Disulfide	0.75	0.75
Diphenylguanidine	0.25	0.25
Total	**263.50**	**278.50**
Specific Gravity	1.52	1.49
Mooney Viscosity, ML, 4 MIN. @ 212 F.	40	40

Mooney Scorch, MS, 250 F. Minutes	Viscosity	
1	22	18
5	19	18
10	18	17
15	18	17
20	46	28

Press Cure @ 287 F. (40 lb.) — 20 Minutes

		Aged 14 Days		Aged 14 Days
	Unaged	@ 70 C.	Unaged	@ 70 C.
Tension and Hardness Data				
Stress, 300%, psi.	500	850	350	600
Stress, 500%, psi.	1400	1900	950	1400
Tensile, psi.	1900	2000	1850	2000
Elongation, %	610	520	700	630
Permanent Set, %	28	21	30	30
Hardness, Shore A.	61	70	53	63
Tear Resistance, Angle, Pounds Per One Inch Thickness	195	180	210	220
Press Cure @ 287 F. (40 lb.) — 30 minutes				
Abrasion Resistance, DuPont	....	680	....	720
Compression Set, 40% Constant Deflection, %	25.1	....	26.3	....
Resilience, Yerzley, % Energy Recovery	57.6	66.3	47.7	57.3
Impact Resilience, G-H, % Rebound	45.1	49.6	38.6	43.3

The comparative data given here illustrate the effectiveness of "CUMAR" resin, EX grade, as a softener and extender for the elastomer blend. As a softener it provides a smooth-processing stock, and as an extender it contributes to the retention of significant physical properties, particularly tear resistance. Based on performance and economy, "CUMAR" resin, EX grade, has found wide application in automotive and aviation parts, footwear and drug sundries, flooring and household goods, heels and soles, and in mechanicals and insulated wire stocks. In contact with enamels and lacquers, the resin is essentially non-migrating, a property which suggests additional applications.

Barrett*

*Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

WORN BANBURY BODIES REPLACED IN FRACTION OF FORMER TIME!

New Three-Point Service Cuts Down Time From 80 Days To 80 Hours

When severe service and abrasive wear finally make major body repairs to your Banbury a necessity, down time required for restoring new-machine efficiency can be cut to a minimum by this new THREE-POINT SERVICE:

1. *Call for Farrel-Birmingham free inspection service* at the first sign of wear. A Banbury specialist will determine the extent of repairs required to restore your mixer to top performance condition. He is also in a position to expedite delivery of new or rebuilt parts and can advise how to take temporary measures to keep production going in the interim.

2. *Order a new or rebuilt body,* while your Banbury can still be kept in operation. Farrel-Birmingham can supply a new or rebuilt body — sometimes "off the shelf" — and the period required for changeover from the time it arrives at your plant is generally ten days, although the job has frequently been done in a round-the-clock week end. (By comparison, necessary time to dismantle . . . ship . . . rebuild . . . and reinstall the original body of your Banbury could run to three months!)

3. *Figure advantages against cost of replacing obsolete bodies of your old Banburys* to modernize such features as dust stops, lubrication system, etc., and improve performance. A fair turn-in value is allowed for all bodies against the cost of a new or rebuilt unit.

Another idea, if your plant operates several Banburys, is to consider the advantages of stocking a spare body and an inventory of miscellaneous repair parts manufactured to exact specifications by Farrel-Birmingham.

Why not ask a Banbury *expert* to tell you more about this *THREE-POINT SERVICE.* He will be glad to talk this over with you at any time, at your convenience.

Rebuilt Banbury body ready for shipment. A pulley has been mounted on the shaft for 8-hour running test.

If you do not already have one, write for a free copy of Banbury Mixer Reference Book, the complete guide for the proper operation and maintenance of Banbury Mixers.

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN. (Telephone Ansonia 3600)

AKRON 8, OHIO, 2710 First National Tower (Tel. Jefferson 3149)

CHICAGO 3, ILL., 120 So. La Salle Street (Tel. Andover 3-3300)

LOS ANGELES 21, CALIF., 2032 Santa Fe Avenue (Tel. Lafayette 3017)

Farrel-Birmingham®

FB-554

Indispensable TO YOU IN THE RUBBER INDUSTRY—

Gives Your Products

PROTECTION and SALES APPEAL

at Little Cost!

BEACOFINISH—a unique family of coating materials conceived to give your products greater durability and eye appeal. These highly concentrated wax emulsions that can be diluted with up to four parts of water can be used with the utmost safety and economy.

BEACOFINISH is therefore of four-fold importance to you:—

1. ***It Protects*** your products against their natural enemies—air, sunlight, moisture and excessive handling.
2. ***It Improves*** the appearance of your product for its uniform coating stimulates greater consumer interest.
3. ***It's Economical*** because its high dilution potential (without losing efficiency) allows one gallon to cover 15,000 sq. ft.
4. ***It's Safe*** being a wax in water emulsion, it eliminates the fire and health hazards of volatile-solvent based finishes.

BEACOFINISH can be applied by dipping, sponging, spraying or brushing—dries in about 20 minutes—faster if force-dried—to give a hard protective coating of great elasticity.

BEACOFINISH may be ordered in Neutral or Black, in varying degrees of luster from brilliant to dull. It is so concentrated, from one drum you can obtain potentially up to five drums of superior coating for your products.

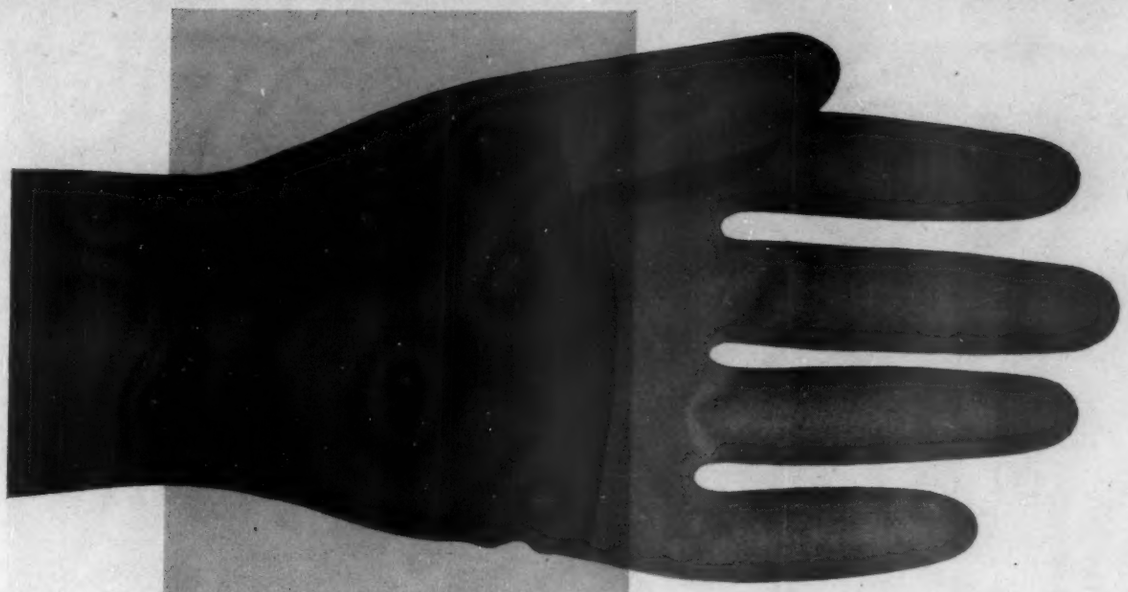
CONSULT US—WRITE US TODAY

Let us show you how BEACOFINISH can make your products more attractive and saleable—protect them from damage—you from loss—in production and transit!

THE
BEACON
PURITY · UNIFORMITY · DEPENDABILITY
COMPANY
Chemical Manufacturers

97 BICKFORD STREET
BOSTON 30 MASSACHUSETTS

In Canada: PRESCOTT & CO., Reg'd.
774 St. PAUL ST. W. MONTREAL



EL-SIXTY

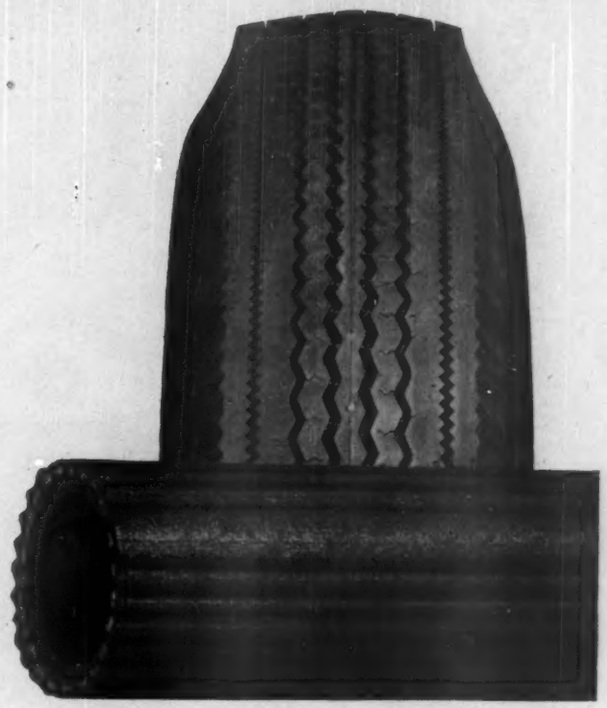
VERSATILE ACCELERATOR FOR ALL RUBBER GOODS

Manufacturers of rubber products ranging from tires, tubes and mechanical goods to the finest of drug sundries will find that El-Sixty* offers them everything they need in an accelerator:

Safe handling
Wide versatility
Good performance in white and colored stocks
Ability to wade through retarding pigments
Excellent in pure gum or reclaim stock
Most stable accelerator in latex—causes no thickening in tanks

El-Sixty can be used alone or activated with Guantal,* Guanidines, Aldehydes, Thiurad,* or Thiurams. For full information, samples and prices, write to MONSANTO CHEMICAL COMPANY, Rubber Service Department, 920 Brown Street, Akron 11, Ohio. If you prefer, simply return the coupon.

*Reg. U. S. Pat. Off.



MONSANTO
CHEMICALS — PLASTICS

MONSANTO CHEMICAL COMPANY RA-5
Rubber Service Department
920 Brown Street, Akron 11, Ohio

Please send me full information ( ); samples of El-Sixty ( ).

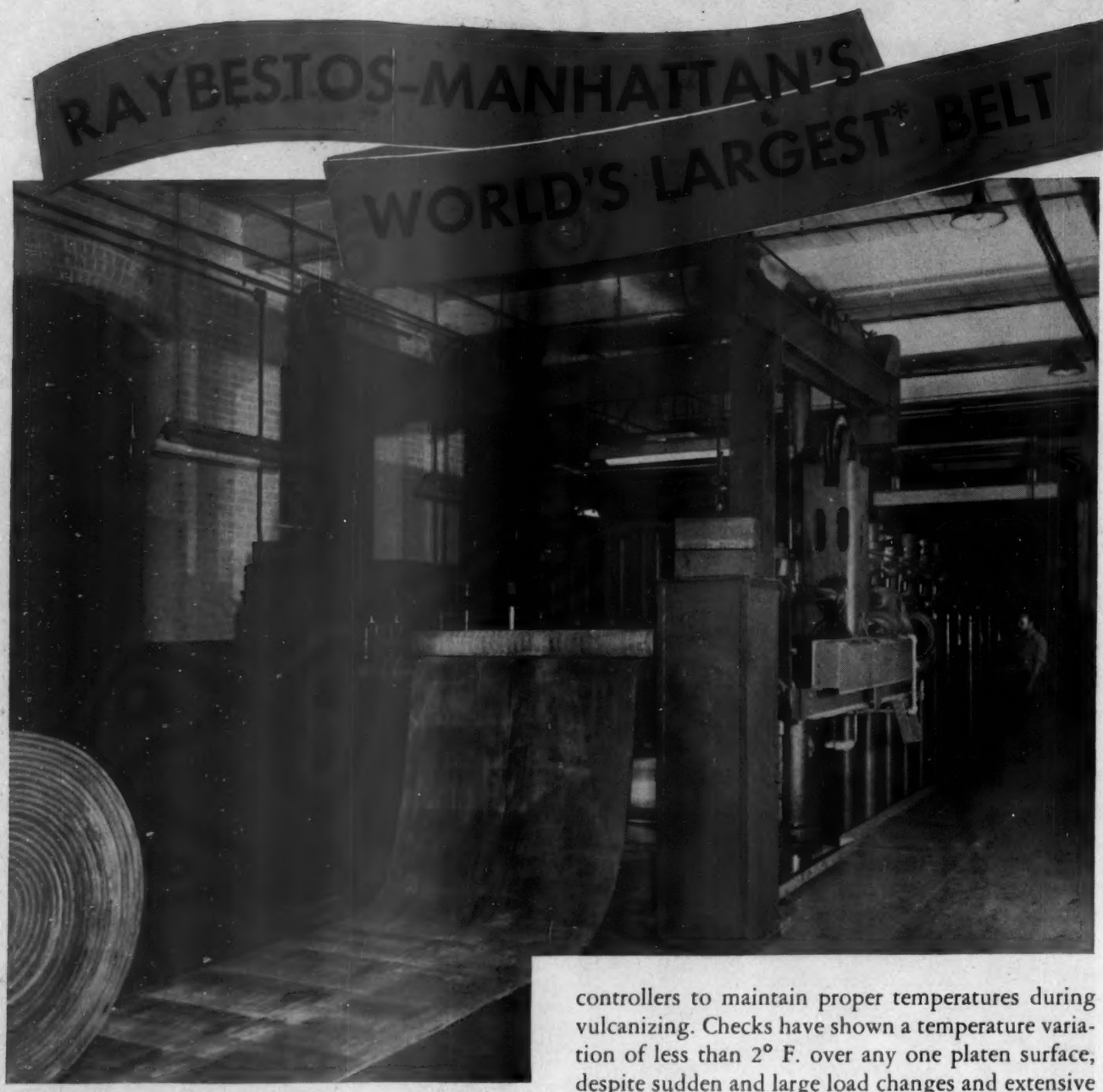
Name_____ Title_____

Company_____

Address_____

City_____ State_____

SERVING INDUSTRY . . . WHICH SERVES MANKIND



With a platen surface almost equal in size to a bowling alley, the world's largest precision hydraulic press for conveyor belts, built by Baldwin to user specifications, is now in operation at the Passaic, N. J., plant of Manhattan Rubber Division, Raybestos-Manhattan, Inc. It handles and cures, with precision, a larger area at one time than any other known press. A 40-foot section of belt can be cured at one time. Widths up to 72 inches can be accommodated, and adjustments easily made to take care of narrower belts.

Unusual features include a moving platen which weighs 45 tons, and eight synchronized controllers to maintain proper temperatures during vulcanizing. Checks have shown a temperature variation of less than 2° F. over any one platen surface, despite sudden and large load changes and extensive surface areas.

While this is the largest unit, Baldwin has furnished many other presses to Raybestos-Manhattan, Inc.

* * *

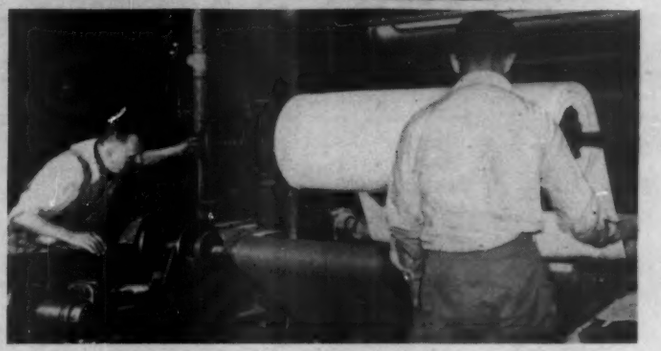
Baldwin's broad experience in the press field, suggested by the Manhattan installation, covers the construction of both standard and special-purpose equipment, and is at your service at all times. A representative will be glad to talk over your needs, and recommend a Baldwin press to meet them.

BALDWIN

*Largest precision hydraulic press for conveyor belts; handles and cures a larger area at one time than any other known press.

PRESS IS A BALDWIN

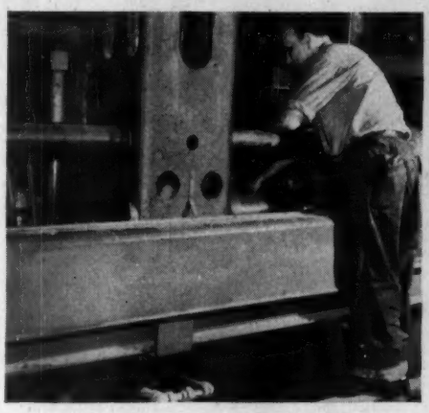
Plasticizing the rubber compound by passing it between rolls. The material is then used for impregnating the carcass, or is calendered for cover stock.



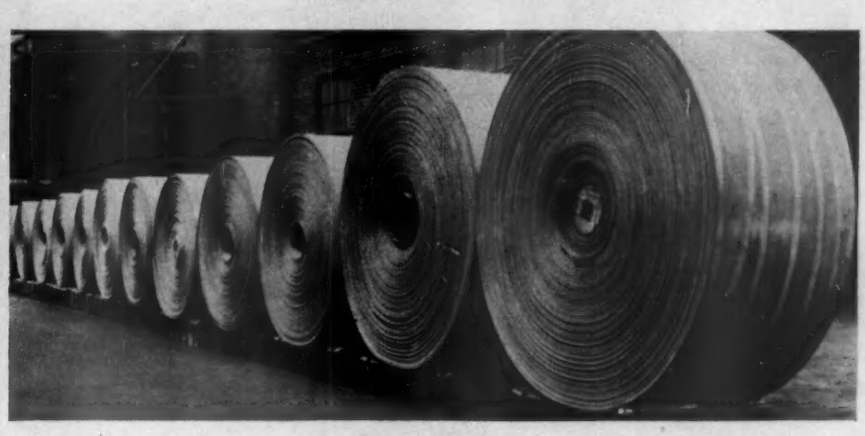
Frictioning the web material. Cotton duck is run against a slower moving roll carrying rubber compound, which is forced into the weave of the fabric.

Building the belt body, by applying layers of cover stock to the frictioned carcass. Layers are rolled down to insure adhesion, and eliminate trapped air.

A roll of belting, ready for curing. The unusually wide product which the new press makes possible is suggested by this illustration.



Guiding the uncured belting in the Baldwin press, prior to curing.



An order for a "mile of belting" ready for shipment.

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.

BLW THE BALDWIN GROUP

HYDRAULIC PRESSES

HEAVY PLATE FABRICATORS FOR INDUSTRY

...that's Biggs

ESTABLISHED 1887

PRESSURE VESSELS
TO MEET EVERY REQUIREMENT

POT VULCANIZER
with quick-opening door

The rubber industry relies on vulcanizers and de-vulcanizers "built by Biggs". This is a logical outcome of our half-century of specialized experience in heavy plate assemblies, and our progressive research in fabricating with Nickel, Monel, Inconel, Stainless Steel, as well as all clad metals — to lengthen life of equipment and safeguard products.

Biggs' modern and complete plant facilities and long technical experience are yours to command or consult . . . Simply write, phone or wire the Akron Office. Our field representative will call to discuss your problem of fabrication for your requirements.

BOILER WORKS CO. The Biggs EST 1887 AKRON OHIO

PRODUCTS BY BIGGS WELDED TO CODE REQUIREMENTS

•

CARBON STEEL • SPECIAL STEEL
SPECIAL ALLOYS and CLAD METALS

BB-349-62

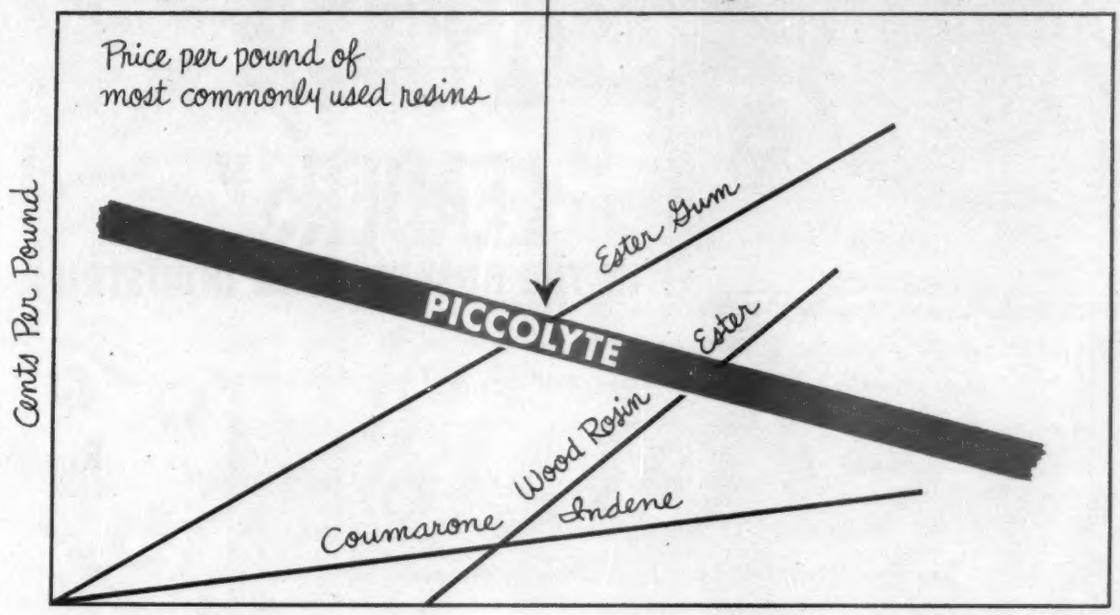
THE BIGGS BOILER WORKS COMPANY • 1005 Bank Street, Akron 5, Ohio

Piccolyte

the Versatile Resin

costs less today than ever before

If you require a light colored, low molecular weight softener of hydrocarbon nature . . . investigate PICCOLYTE!



Ideal for EXTENDING, TACKIFYING, CEMENTING

ECONOMICAL. In addition to its low cost per pound, Piccolyte is soluble in low-cost naphthas in all proportions (an important additional source of savings)—as well as in many other solvents.

PALE COLOR, NON-YELLOWING. These very pale, pure hydrocarbon products do not become yellow, but retain their pale color.

PROPERTIES. Piccolyte is a thermoplastic terpene resin, compatible with plantation rubber, many synthetic types including polybutene, and other compounding materials. It is stable, neutral, inert, free from toxicity. Made in nine melting points, from 10° to 125° C. Precision manufacturing control assures dependable uniformity of quality.

Write for free sample of Piccolyte and complete details, given in the new bulletin. Use the coupon.

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORP.
CLAIRTON, PA.

Pennsylvania Industrial Chemical Corp.
Clairton, Pennsylvania

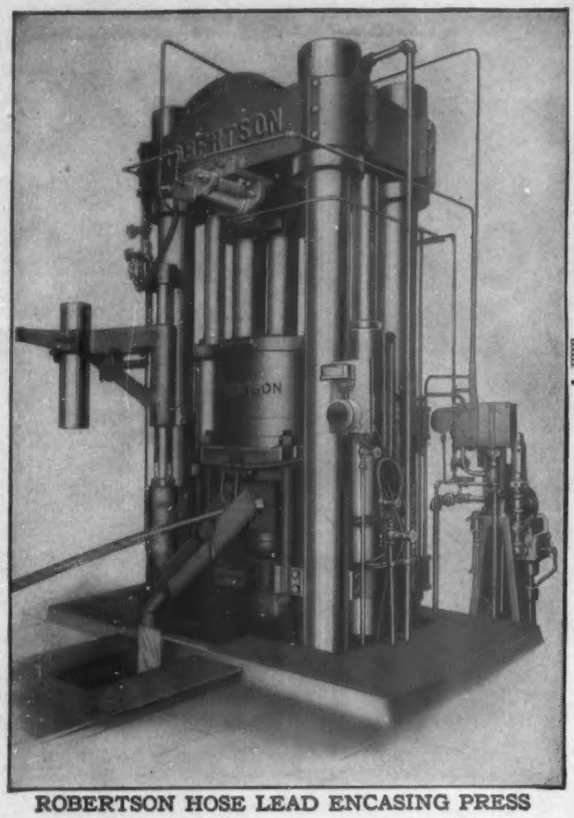
Please send me a free sample of Piccolyte, and your new bulletin. I wish to investigate Piccolyte for (application) .....

Name .....

Company .....

Address .....

(RA)



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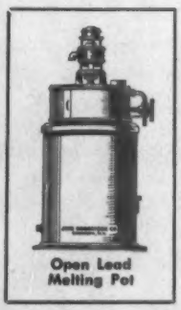
Robertson

a "LEADER *serving* LEADERS"

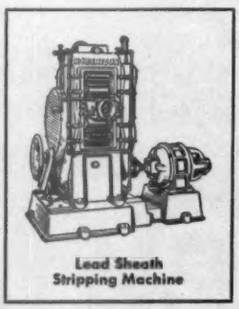
IN THE HOSE & CABLE INDUSTRIES

What makes Robertson Equipment widely used throughout the years? It's *Quality . . . of design . . . of construction . . . of performance.* Robertson High Pressure Hydraulic Equipment is virtually "custom-built" to conform to your exacting requirements . . . and guarantees maximum production of a uniform product.

For over 90 years, Robertson has been designing and building high pressure hydraulic equipment *exclusively* . . . and doing it so well that Robertson has become a *"leader serving leaders"* in the hose and cable industries.



Open Lead Melting Pot



Lead Sheath Stripping Machine

JOHN Robertson COMPANY INCORPORATED

135 WATER STREET, BROOKLYN 1, NEW YORK

Designers and Builders of all Types of Lead Encasing Machinery

Since 1883

In TUBING, CALENDERING and SPREADING...

New ALBALITH-73

THE SURFACE-TREATED LITHOPONE

EXPEDITES PROCESSING

ALBALITH-73, a special lithopone, rates high as a processing aid. Because its surface is treated with selected fatty acids, this pigment makes for easier mixing, and smoother tubing, calendering and spreading. Thus, Albalith-73 steps up output and improves product quality of black or non-black compounds.

ALBALITH-73 improves processing by lowering viscosity and "nerve" even more than do normal lithopones or Protox-166 Zinc Oxide*— well recognized for those features—as shown by the following data:

	WILLIAMS		MOONEY	
	Plasticity (70°C. @ 3 min)	Recovery (1 min)	Viscosity (ML100°C. @ 3 min)	Recovery (1 min)
Albalith-73	1.94	0.095	39.0	108
Normal Lithopone	2.07	0.11	42.0	120
Protox-166 Zinc Oxide	2.05	0.09	45.5	125

(Values were obtained on stocks 24 hours after mixing.)

In addition, ALBALITH-73 imparts numerous other advantages, such as low water absorption, good electrical properties and high resilience, together with good tensiles and tear resistance.

Add ALBALITH-73 to your compounds to obtain smoother, quicker processing and better quality of products.

U. S. Patents 2,303,329 and 2,303,330.

COMPOUND

Smoked Sheet	100
Sulfur	3
Mercaptobenzothiazole	1
Agerite Powder	1
Stearic Acid	3
Lithopone	70.4 – 0
Protox-166 Zinc Oxide	5.0-100

HORSE HEAD PRODUCTS

THE NEW JERSEY ZINC COMPANY

Founded 1848

160 FRONT STREET • NEW YORK 7, N. Y.

For Better, Faster, Lower-Cost Coating with Organosols and Hydrosols

● Industrial Ovens coating, evaporating and fusing equipment is increasing production, improving quality and cutting costs for many of the major coaters, proofers and converters of textiles, papers, films and foils. Besides offering higher speed, greater quality control and lower cost, this equipment is extremely flexible and safe in its operation.

The unit shown embodies many design and operating features seldom, if ever, found in ordinary coating equipment. These features result in higher production speed of goods, lower operator-attendant requirements and more accurate control of coating thickness.

Proper attention to safety factors and solvent loads assures trouble-free operation on even the most volatile solvents, with complete safety and dependability of evaporators and fusers in either continuous or non-continuous operation.

Because of sound engineering and advanced design, IOI systems for organosols give the operator many advantages, including the following:

1. True constant tension and velocity control of web through use of a synchronized system drive.

2. Flexibility of coating method through IOI combination coaters for roller or knife coating.

3. Close uniformity of evaporator temperature because of IOI high velocity jet system.

4. High coating speeds because of proper explosive vapor concentration control in evaporator.

5. IOI unified responsibility for the entire installation.

If your production involves the coating of textiles, papers, films or foils with any type of coating material, it will pay you to consult with IOI.

Write for "Blueprint for Industry, Part V—Coating and Handling Equipment for Textiles, Papers, Films and Foils"

IOI EQUIPMENT FOR THE RUBBER INDUSTRY

- Complete Fabric Cementing Systems
- Complete Tire Fabric Latexing Systems
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- Dip Tanks
- Drying Ovens
- Constant-Speed, Constant-Tension, Extrusion Takeup Machines for Plastic Hose and Cords, Rubber Tubing and Other Continuous Materials
- V-Belt Cord Dryers
- Curing Ovens
- Calender Takeups and Letoffs
- Spreader Takeups
- System Drives

INDUSTRIAL OVENS, INC.

IOI ENGINEERING VERSATILITY

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HI-SIL®

the new pigment with unique properties that warrant your investigation

Hi-Sil is a new hydrated silica pigment of extremely fine particle size—.025 micron. It presents excellent opportunities for obtaining desirable qualities in a variety of compounds.

IN NATURAL RUBBER AND GR-S—Hi-Sil imparts exceptional hand tear and other physical properties, exceeding all other commercial non-black pigments.

IN NEOPRENE OR NITRILE RUBBERS—Hi-Sil gives considerably higher tensile and hardness, and much better tear resistance without decrease in elongation.

IN VINYL RESINS—Hi-Sil imparts unique properties desirable for numerous applications.

HI-SIL AVAILABLE
IN COMMERCIAL QUANTITIES
. . . DATA FURNISHED ON REQUEST

Hi-Sil is a companion product of the widely used pigments, Calcene T and Silene EF. The performance of Hi-Sil in a variety of compounds can be checked in data now available. Address requests for data and samples to Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pa.

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All is not Gold . . .

"DOC" MacGEE SAYS: Appearances are often deceiving; things aren't always what they seem to be. Yet, sooner or later, truth will out; the genuine article outshines the imitation.

That's why, year after year, more and more users of industrial naphthas switch to SKELLYSOLVE. For nearly 20 years, SKELLYSOLVE has proved its ability to help save money, improve operations, and produce better products in various industrial fields using naphthas.

Pioneering in the large-scale production of the hexane, heptane, and octane type naphthas from natural gas, Skelly Oil Company today produces a complete, comprehensive line of specialized solvents of exceptional quality.

Uniformity, purity, close boiling ranges, minimum of unsaturates and aromatics, freedom from foreign tastes and odors, dependability of supply . . . these are SKELLYSOLVE qualities that are widely imitated but seldom matched. So why bother with something claimed to be "just as good as" or even "better than" SKELLYSOLVE.

All too often, the risk is too great to use anything but genuine SKELLYSOLVE. So join the growing numbers of purchasing agents, chemists, superintendents, and managers who say, emphatically, "I want the finest; I want the proved; I want the one and only SKELLYSOLVE!"

Skellysolve

SKELLY

SOLVENTS DIVISION, SKELLY OIL COMPANY, KANSAS CITY, MO.

CARBON BLACKS

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

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UNITED BLACKS

Flames in a channel process plant.

KOSMOBILE 77-EPC

KOSMOBILE HM-MPC

United channel blacks have an enviable record for uniform quality and satisfactory performance. Years of experience and skill govern their manufacture.

United channel blacks are specification-made for use in your rubber, and they are repeatedly and thoroughly quality-checked by us in a number of ways.

United channel blacks are properly pelleted for ready breakdown and dispersion in your mixing and milling equipment.

United channel blacks are dependable for satisfactory processing at all stages and for quick, tight cures.

United channel blacks possess that high reinforcement so essential for the satisfactory performance of your goods in service.

UNITED CARBON COMPANY, INC.

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GET QUALITY IN QUANTITY

By the Pail, Drum or Tank Car, Flintkote can supply top quality adhesives to improve your product or processing

Let us help you solve production problems in coating, lamination, cementing, sealing, saturating or related processes.

Take a good look at the Flintkote line. Chances are a standard Flintkote product or an available formula will fit your requirements.

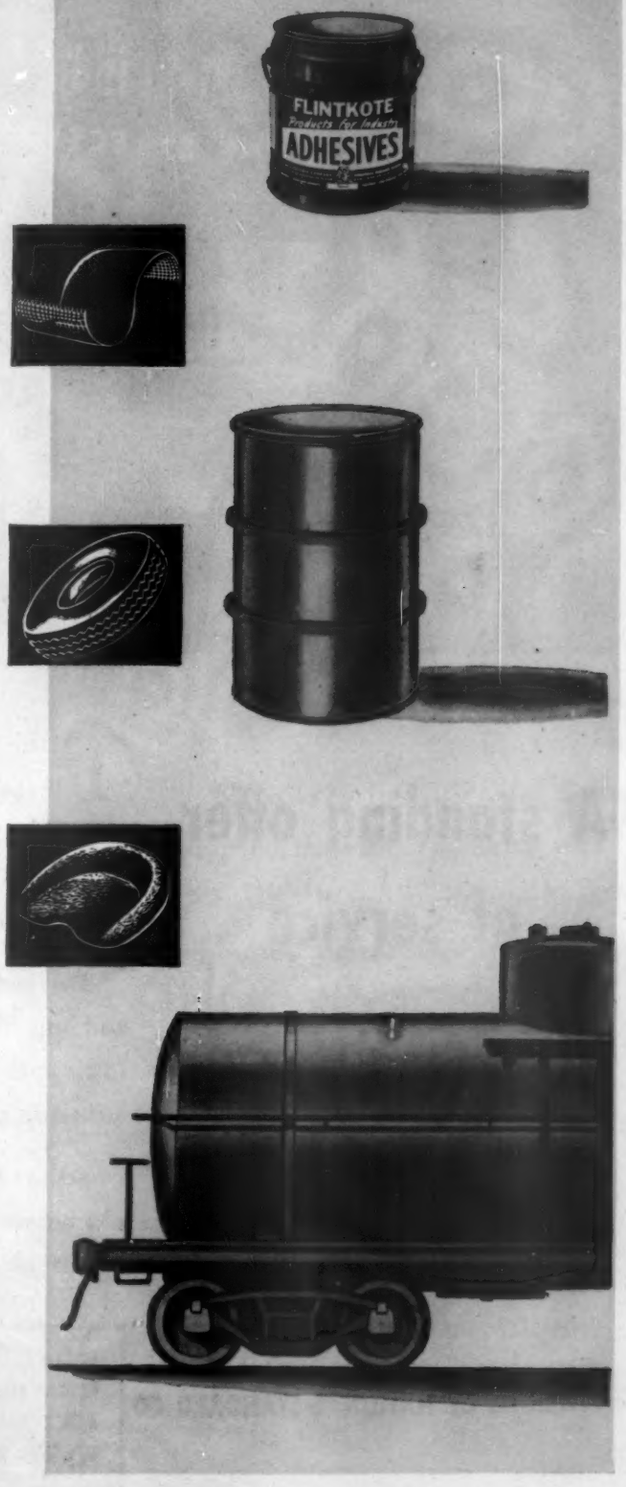
Look over the various types . . . crude, synthetic and reclaimed rubbers . . . natural and synthetic resins . . . asphalt emulsions and cutbacks.

They're available in many forms . . . water dispersion types (non-inflammable) . . . solvent solution types . . . hot melt types and latex compounds. For roll coating, trowel, brush or spray application.

Do you work with metals, fiber, ceramics, paper, textiles? Do you want a product for end use . . . or for formulating and resale?

Whatever your requirements, you may save important time and money with a Flintkote product . . . either standard, or one we've made up just for you.

Our research, development and manufacturing facilities are at your service.



THE FLINTKOTE COMPANY
Industrial Products Division
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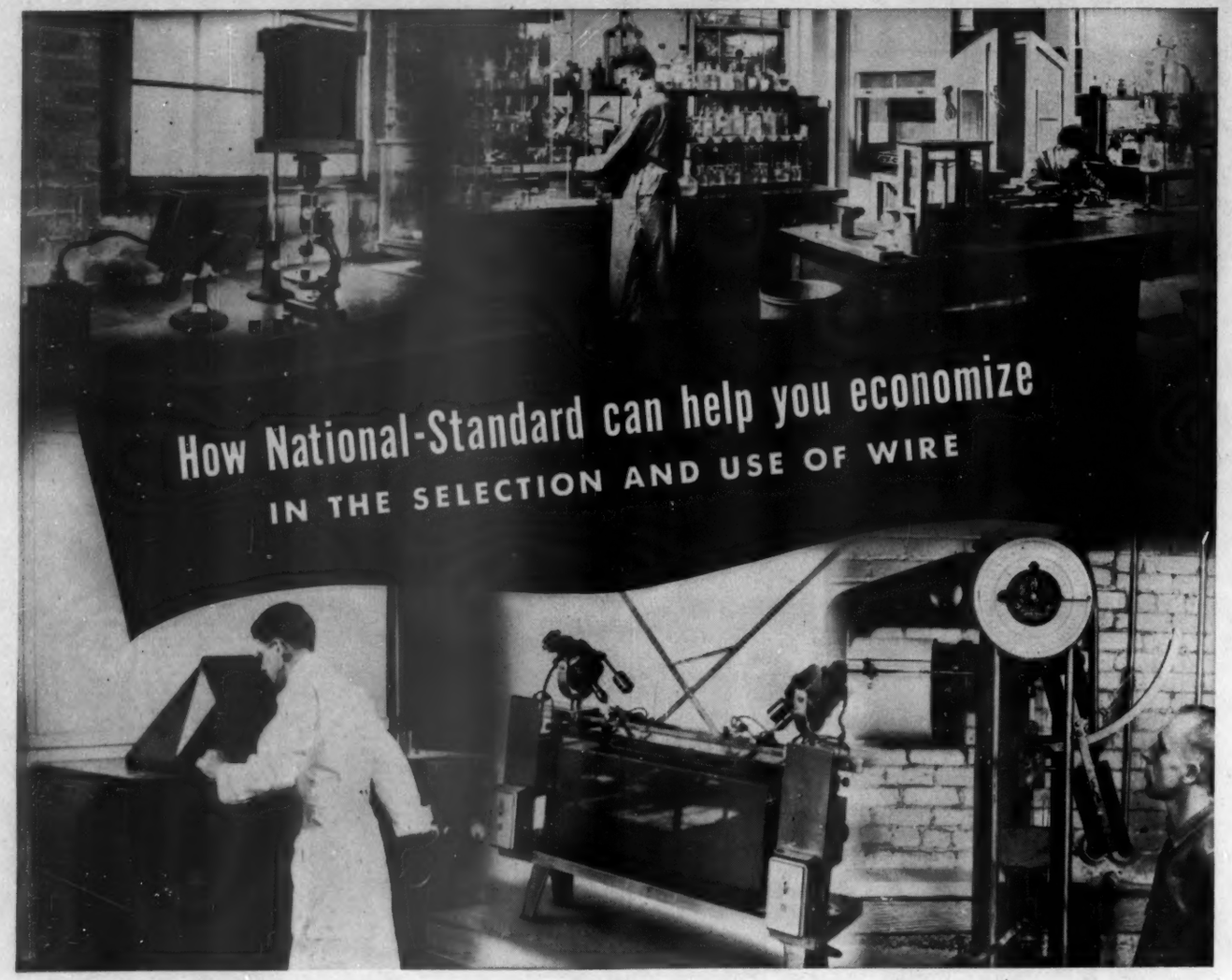
FLINTKOTE
Products for Industry



A standing offer of service

THERE may be ways in which you can save a "penny" here and there in producing your tire beads, hose, belts or other wire-in-rubber products. National-Standard engineers, who have contributed cost-saving suggestions in many a rubber plant, always welcome the chance to help you find out.

For here at National-Standard we've spent a lifetime studying and improving the behavior of wire in rubber—digging into all the intricacies of application, fabrication, finish, corrosion, strength, adhesion and innumerable details you might never bother with.

So even if you don't have a serious "problem", there's still a chance we can come up with a suggestion or two that will save you money or improve your product. Just say when.

NS
NATIONAL-STANDARD Company
NILES, MICHIGAN

DIVISIONS OF NATIONAL-STANDARD CO.

ATHENIA STEEL.. *Clifton, N. J.*	Flat, High Carbon, Cold Rolled Spring Steel
NATIONAL-STANDARD.. *Niles, Mich.*	Tire Wire, Fabricated Braids and Tape
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PARA-FLUX®

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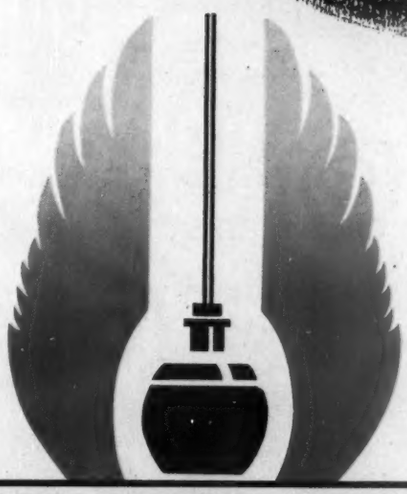

Since 1925 The C. P. Hall Co. has supplied the rubber industry with PARA-FLUX.® Many substitutes have appeared on the market since that time, but PARA-FLUX® continues to be the standard softener and plasticizer for the rubber industry.

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CHEMICAL MANUFACTURERS

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Now...

NORMAL LATEX in BULK

For the first time since the war, General Latex is now importing normal latex, as well as centrifuged, in bulk and can supply you with high-quality latex from the Malayan plantations of Harrisons & Crosfield. Normal latex in bulk not only costs less per dry pound than concentrated, but possesses many physical characteristics which make it particularly desirable for compounding and processing.

For example:—

- Normal latex is more uniform in bulk than in drums.
- Fewer handling operations at the plantation make it cheaper.
- The smaller average particle size gives better dispersion and penetration.
- Anti-oxidant effect and better cure acceleration — due to retention of natural non-rubber constituents.
- Excellent stability.

Are the high solids of concentrated latex needed for your operation, or can the economies and advantages of normal latex be utilized?

NOW AVAILABLE FROM STOCK FOR SHIPMENT IN TANK CARS OR DRUMS

SAMPLES AND PRICES ON REQUEST

GENERAL LATEX & CHEMICAL CORPORATION

CAMBRIDGE, MASS.

Importers and Compounders of Natural and Synthetic Rubber Latex

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Exclusive agency for sale of **Harrisons & Crosfield** Malayan latex in U. S. A.

Why compounders prefer CIRCO light rubber-processing aid

1 SPECIALLY REFINED FOR RUBBER-PROCESSING

Circo is not an ordinary mineral oil. Circo is a petroleum-base processing aid, refined within rigid specifications solely to meet the exacting requirements of rubber compounders.

2 PRODUCT UNIFORMITY ASSURED

Uniformity is vital to profitable mass production. Circo is refined under precision-controlled conditions, permitting no deviation from specifications. With Circo the danger of variation is minimized.

3 HIGH NAPHTHENICITY

Leading rubber technologists are unanimous in agreeing that hydrocarbons with a *high degree of naphthenicity* are best suited for processing and plasticizing rubber. Sun's exclusive refining process makes possible high naphthenicity in Circo.

4 EASY TO HANDLE

Circo is clean and free-flowing, even in cold weather.

5 FAIR PRICE

To be certain of always getting uniform, top-quality results, leading compounders pay slightly more for Circo. They recognize the need for a precision-produced product, and will not risk failures through the use of low-price petroleum-base oils.

6 "JOB PROVED"

Circo has been used by rubber processors for over 12 years. Hundreds of rubber manufacturers are sold on the performance and durability of goods processed with Circo. They know that such products turn in remarkable service records.

Every user of Circo is entitled to the technical assistance of Sun's specially trained and widely experienced rubber technologists. Such service is rarely available to the user of ordinary petroleum-base oils. For further information, just write or call the Sun Office nearest you.

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SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

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Issued monthly, the RUBBER STATISTICAL BULLETIN is published by the Secretariat of the Rubber Study Group. This group, with headquarters in London, is the international organization which was established to collect statistical and other general information on rubber. Regular statistics are furnished by the numerous governments cooperating in the program, with the result that the figures appearing in the BULLETIN are the nearest approach to world-wide official figures.

Each issue of the BULLETIN is replete with up-to-the-minute world-wide data on the production, exports, imports, consumption and stocks of rubber. Over 55 separate tables are used to enable the user to locate specific information on any phase of the rubber picture. Each issue is divided into 8 separate sections, as follows: Natural Rubber, Natural Latex, Synthetic Rubber, Synthetic Latices, Natural and Synthetic Rubber, Reclaimed Rubber, Rubber Manufactures, and General.

The data furnished in the BULLETIN is of utmost importance to all rubber manufacturers as well as to Brokers, Dealers, Importers and Commodity houses of all kinds. Specimen copies will be furnished without charge on request.

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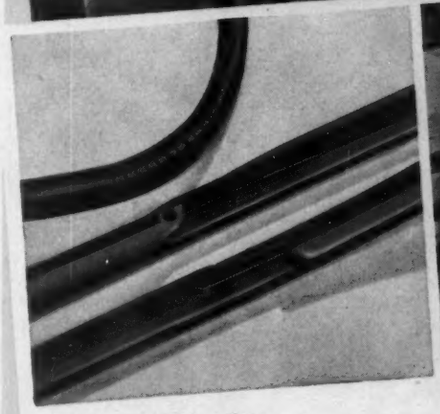
DOW CORNING SILICONE MOLD RELEASE EMULSION NO. 35A

Gives greater stability in use and in storage, greater stability in contact with hard water.



Fewer Rejects

Intricate molded products such as these automobile window ventilator sealing strips must have uniformly finished edges and be free of tears and uneven surfaces. DC Mold Release Emulsion No. 35A is used in molding this production by Yale Rubber Mfg. Co. because it improves stock flow to intricate parts of the mold thus eliminating not-filled-out rejects.

Easier Release

Roller skate wheels molded of heavily loaded stock at Yale Rubber Mfg. Co., cannot be flexed in stripping. Proper release of such pieces depends on the slip of the mold surface. DC Mold Release Emulsion No. 35A thoroughly wets and adheres to metal surfaces, permitting unusually easy release of molded pieces regardless of the stock.

Improved Finish

Gear shift lever boots molded of light colored stock at Yale Rubber Mfg. Co. must match the decorative colors in automobile interiors. Consequently, the boots must be clean, perfectly shaped and unstained when taken from molds. DC Mold Release Emulsion No. 35A will not stain the parts and it leaves molds clean, free from carbonaceous deposits.

Call our nearest branch office for technical assistance on molding problems or write for data sheet No. AB-8.

Dow Corning

FIRST IN SILICONES

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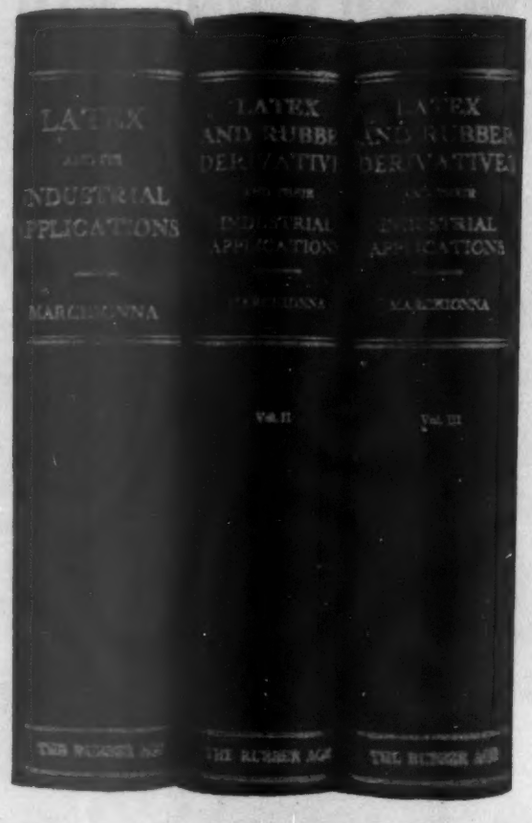

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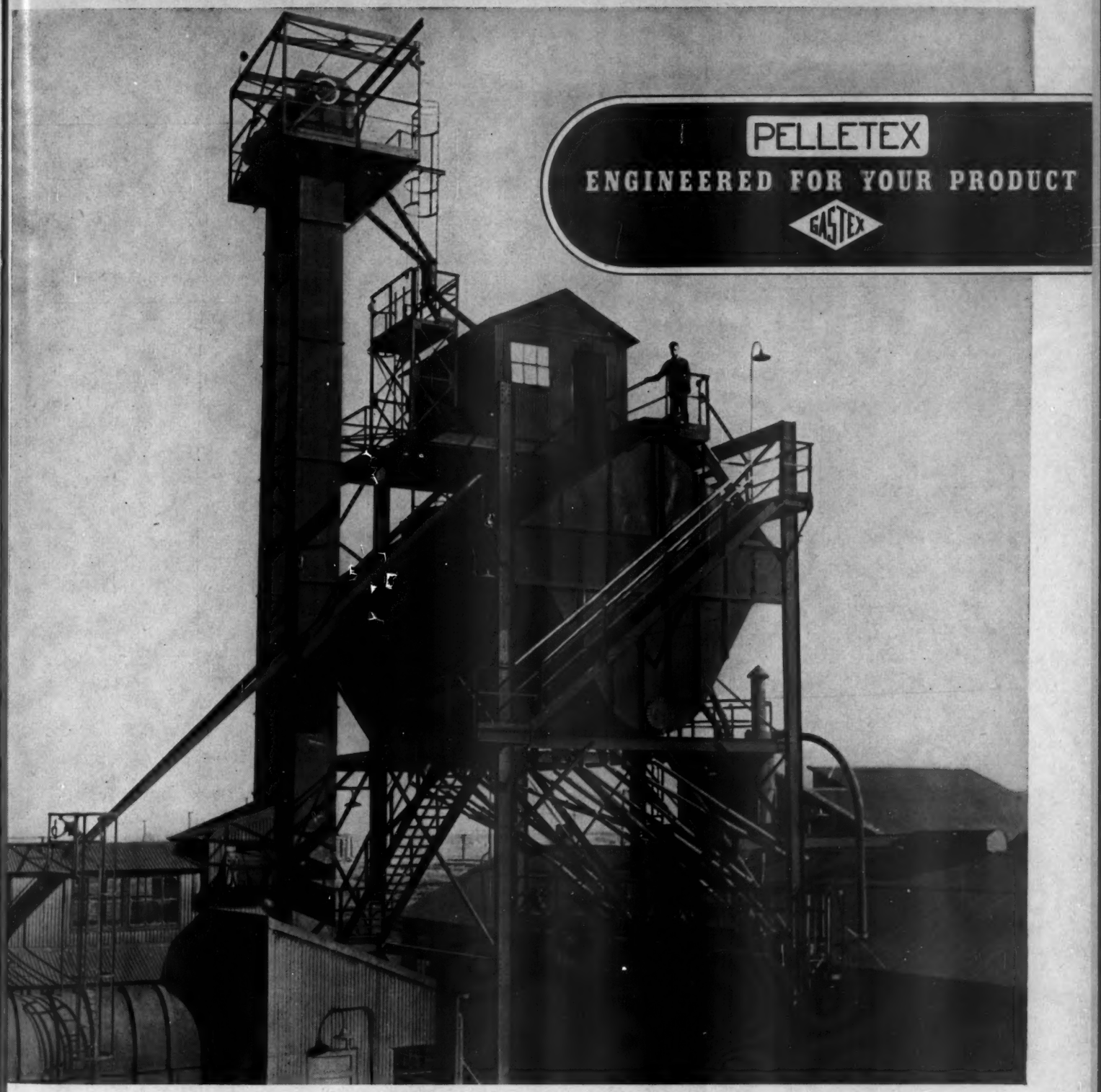

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Vol. 65, No. 5 AUGUST, 1949

Compounding of O-Ring Hydraulic Packings

By RICHARD A. CLARK and LaVERNE E. CHEYNEY*

Battelle Memorial Institute, Columbus, Ohio

THE O-Ring is a special type of hydraulic packing, having a "toroid" or "doughnut" shape, and made to strict dimensional tolerances. It may be used to seal either static or moving parts. This type of packing is best known in the aircraft industry and it is here that the service conditions to be met are the most severe. It has, however, a growing demand outside the aircraft industry for many hydraulic applications in automobiles, locomotives, hydraulic presses, and other pieces of hydraulically operated equipment.

This paper will be largely limited to compounding requirements for O-Rings acting as seals between moving parts in aircraft hydraulic systems. Such systems are used to move control surfaces, raise and lower landing gear, open and close bomb-bay doors, adjust the pitch of a propeller blade, and supply power for numerous other essential operations. A number of references may be found in the literature on the use of O-Rings for such applications, but these are limited in scope largely to the engineering and design aspects of this type of packing *(2, 8, 10, 11, 12, 18, 20, 24, 28)*.

The Hydraulic System

The basic components of any hydraulic system are (1) a pump to generate hydraulic pressure, (2) a fluid to transmit this pressure, (3) a piping system to direct the fluid to the location where needed, (4) a means of converting the hydraulic pressure to work, and (5) auxiliary equipment to control and regulate the pressure. The primary function of hydraulic packings is to seal this system at various locations and prevent the loss of hydraulic fluid. In the conversion of hydraulic pressure to work, a piston-cylinder assembly is most commonly employed. This is sometimes called an actuating cylinder, and normally employs at least two hydraulic packings. When two are used, one packing has the function of sealing the entry of the piston rod into the cylinder and the other of sealing between the piston and the inside of the cylinder wall. Packings also are used in aircraft for many static applications, as in joining two nonmoving parts. However, the sealing of moving parts, such as in the piston-cylinder assembly, represents the most severe type of duty.

General Requirements

An O-Ring should perform its function of sealing under difficult and adverse conditions of service. Some of the O-Ring requirements for service in aircraft are as follows:

(1) It should be made to close dimensional tolerances. An O-Ring fits between metal components having exact dimensions and works best when it has a controlled amount of squeeze.

Note: This paper was presented before the Division of Rubber Chemistry, American Chemical Society, Detroit, Mich., November 8, 1948.

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(2) It should not be adversely affected by the hydraulic fluid employed. While a small amount of swell is not objectionable, an excessive swell may increase the size of the O-Ring to such a point that it is extruded into the clearance between the piston and the cylinder, where the extruded portion can be easily broken off. Fig. 1 illustrates this extrusion. Excessive swell may also be associated with a diminution in physical properties. Shrinkage is also to be avoided, since this would reduce the squeeze necessary to seal and might lead to leakage. Both the composition of the O-Ring and the type of hydraulic fluid affect the swelling properties of an O-Ring.

(3) It should withstand working hydraulic pressures without leakage. Hydraulic pressures of 1500 to 3000 lbs./sq. in. are normally used in aircraft hydraulic systems. Pressures of 5000 lbs./sq. in. and higher are employed for special applications. It has been pictured by some that hydraulic pressure forces an O-Ring into the opposite side of its gland and tends to extrude it into the clearance between the piston and the cylinder *(2, 11)* (see also Fig. 1). Leather back-up rings are placed in the gland on both sides of the O-Ring to prevent this extrusion at pressures above 1500 lbs./sq. in. The need for back-up rings varies with the ratio of the O-Ring cross-sectional diameter to the inside diameter. This ratio is usually kept small to avoid excessive metal wall thicknesses and the extra weight involved. It has been claimed by some that when back-up rings are used, they do the effective work of sealing at pressures higher than about 200 lbs./sq. in., while the O-Ring seals at lower pressures. Resistance of the O-Ring to deformation under pressure (compressive modulus) is usually associated with the physical property called "hardness."

(4) It should seal at arctic temperatures and not be deteriorated at sun temperatures reached in the tropics. For an O-Ring to seal at low temperatures, it is generally believed that low-temperature flexibility must be built into the compound. An O-Ring with this property is better able to conform to minor variations in the metal components contacted during a given piston-cylinder stroke.

(5) It should have low friction, particularly low breakout friction. Low friction gives to the aircraft pilot a high degree of "feel" in the operation of his controls, whereas with high friction this "feel" is largely lost. High friction might stem from several sources, such as a tacky O-Ring surface or a corroded metal surface. Tackiness of an O-Ring surface might be a function of the O-Ring or the hydraulic oil, while corrosion of the metal surface might be a function of the metal, the O-Ring, or the hydraulic oil.

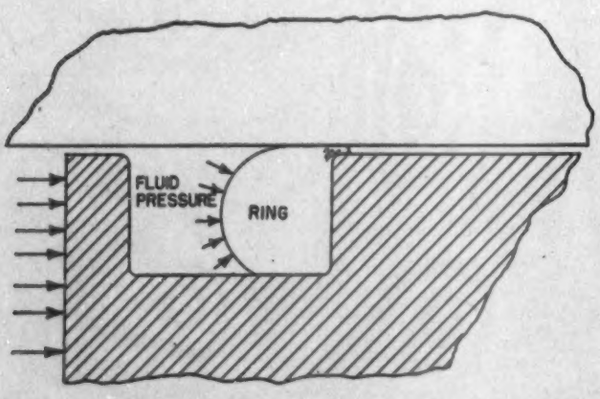

FIG. 1—Schematic drawing showing example of O-Ring extrusion.

(6) It should have a life expectancy equal to that of the airplane. This means that it should have sufficient torsional strength and elongation to avoid twisting-type failures *(18)* and sufficient wear resistance to withstand abrasion by the metal components of the hydraulic system. Fig. 2 illustrates the effect of twisting on an O-Ring of insufficient torsional strength. These properties should be maintained over long periods of time. Torsional strength can very well be viewed as being a composite of several physical properties, including tensile strength and tear resistance, with the exact relationships not entirely known. The tensile strength and elongation necessary for the stretching of O-Rings during their installation are not considered difficult requirements to meet under normal conditions. Care must be exercised in their installation, however, to avoid damage to O-Rings by rough handling or contacting sharp metal corners.

Specific Requirements

There are three distinct types of tests for O-Ring packings presented in the Army-Navy specification for hydraulic packings and gaskets *(4)*. These are: (1) physical tests whose purpose is only to control product uniformity, (2) tests which evaluate the O-Rings in terms of properties believed requisite for performance, and (3) special tests designed to simulate service conditions. Each of these will be discussed separately.

The control tests in the specification include the following: specific gravity, tensile strength, ultimate elongation, tensile stress (modulus), and tear strength. For original qualifications of a given O-Ring compound, no established values for the above physical properties must be met. However, to insure uniformity of product only a limited amount of deviation from the original test values is permitted. This indicates that it has not been found possible to define a satisfactory O-Ring in terms of these properties, and from a rubber practice viewpoint these tests serve only to control the uniformity of product.

Specification tests which are intended to measure physical properties requisite for performance include the following: hardness, permanent set, volume swell in hydrauic oil, corrosion of and adhesion to metal surfaces, and flexibility and resilience at —65°F.

A minimum durometer hardness limit of 68 has been established on the logical basis of softer stocks being more susceptible to distortion and extrusion under pressure. A maximum of 4 per cent permanent set is permitted, when tested by stretching an O-Ring over a tapered cone to 150 per cent elongation, holding this elongation 10 minutes, and measuring recovery after 10 minutes' rest. This test is based on the desirability of having an O-Ring continually exert pressure against the metal parts it is sealing, so that leakage will not occur.

Volumetric swell is held between 0 to 8 per cent, since the recess or gland in which the O-Ring resides provides only a limited volume, and expansion beyond that point leads to extrusion between the piston and cylinder. Excessive swell also leads to a diminution in many desirable physical properties and may also lead to failure on this account. Obviously, the original dimensions of the O-Rings must be kept within narrow limits, so that the volume of the O-Ring after swelling can be more closely controlled. Tests to determine the corrosion and adhesion of packings to metal surfaces assist in producing O-Rings which will not seize or damage the metal parts of the hydraulic system contacted by the packings. Flexi-

bility and resilience tests are made on packings at —65°F., as some assurance that the packings will not be brittle and that there is still sufficient resilience to seal at this temperature.

The specification tests designed to simulate service conditions include the following: performance at high and low temperatures, endurance cycling tests, fatigue resistance, and a crush test. The performance and cycling tests are carried out in a specially designed packing test machine, containing two piston-cylinder assemblies which can be hydraulically operated over a temperature range of —65°F. to 160°F. and with pressures varying over the range of zero to 1500 lbs./sq. in. During the approximately two weeks required to complete the performance tests, made at high and low pressures and high and low temperatures, determinations are made of leakage (a maximum of 20 drops per gland permitted) and breakout friction (40 lbs./sq. in. maximum permitted) and an examination is made of the packing and the metal surfaces which contact the packings. The O-Rings are examined for permanent set and swell, while the metals are examined for sticky or gummy residues, and discoloration or corrosion.

The endurance cycling test is conducted at a temperature of 110°F. to 130°F., at a minimum pressure loading of 1500 lbs./sq. in., with a 4-inch stroke, and operating at a minimum of 30 cycles per minute for a total of 70,000 cycles (for nonbreathing cylinders). Interruptions are made for standby periods. At the end of the test the total leakage should not exceed an average of 1 cc. per thousand cycles of operation.

The fatigue resistance test involves stretching O-Rings over a special set of pulleys and driving one of the pulleys with an electric motor traveling at about 1750 r.p.m. for a specified time. This test is of value in showing up cracks, wear, or other defects.

The crush test involves placing a half twisted O-Ring between special metal plates and compressing it with a load of 5600 pounds for 20 hours. Not only should there be no cracking or deterioration of the O-Ring as a result of this test, but there should be a minimum of 85 per cent recovery. The crush test was designed with the purpose of reducing the number of spiral-type failures in service. While many doubt that it simulates service conditions, it has materially reduced this type of service failure. There is little doubt among O-Ring manufacturers that this is one of the most difficult tests to pass.

O-Ring Compounding

The above discussion of general and specific requirements has been presented for the purpose of showing some of the properties which an O-Ring must have to be acceptable for application in aircraft hydraulic systems. It is the task of a rubber compounder who desires to make O-Rings to incorporate these desired properties into a rubber stock. The components in that stock which will affect these properties include the base polymer, the curing system, reinforcing agents, plasticizers, and miscellaneous additives.

The Base Polymer: In the selection of the base polymer for O-Ring compounding, resistance to swelling by hydraulic fluid and low-temperature flexibility are perhaps the two most important properties to be considered. This immediately suggests that a nitrile or a polysulfide synthetic rubber might be satisfactory. The latter type polymer, however, is ruled out for its low strength, poor abrasion resistance, and high permanent set. Natural, butyl, and GR-S rubbers have too high a degree of swell in hydraulic fluid and GR-M rubber is too poor in low-temperature flexibility for this application. One other possibility is Neoprene FR, an isoprene-modified chloroprene rubber, which is comparable in many respects to the nitrile-type rubbers for resistance to oils and low-temperature flexibility.

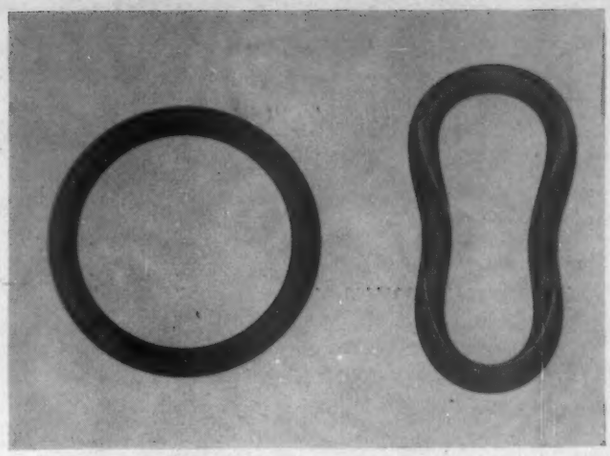

FIG. 2—Effect of O-Ring twisting in groove.

In the selection of the best nitrile rubber for producing O-Rings, consideration must be given to the monomer ratio used to make the polymer. It has been reported in the literature *(19)* that the higher the acrylonitrile content the better is the swelling resistance and the poorer is the low-temperature flexibility. Obviously, the monomer ratio of the polymer must be adjusted as a compromise between swelling properties and low-temperature flexibility. At the present time, the polymer which is accepted as the best compromise for these properties is Perbunan 18, although Butaprene NF has an acrylonitrile content close to Perbunan 18 and might be suitable. These two nitrile rubbers and Neoprene FR are believed to be the commercial polymers most suited for this application.

Variations in the base polymer must be held to a minimum in order to reduce the variation in swell of O-Rings. Although it is possible to regulate the swelling of a base polymer by the proper choice of plasticizers, any variation in swelling properties of the base polymer will disturb the limits of this possible regulation. A study of the variability of Perbunan 18 *(22)* has indicated that the lot-to-lot variation of this polymer is essentially the same as the batch-to-batch variation, indicating a high degree of control in its manufacture.

In considering the swell of the base polymer it is pointed out that different oils swell rubber to varying extents *(14)*. Correlations of the swelling characteristics of oils have been made, with their aniline point *(7)*, gravity index *(13)*, Diesel index *(14)*, refractive index, and structure of the oil *(21)*. In the Army-Navy Aeronautical specification for petroleum base hydraulic oil *(3)*, the swelling limits of this type oil are regulated by the aniline point of the oil and the ability of the oil to swell standard synthetic rubber samples. For the latter test the swelling limits are as follows:

Standard Rubber	*Base Polymer*	*Volume Increase, %*
F	Perbunan 26	8.5-14.5
H	Hycar OR-25	5.5- 9.5

By a strange paradox, this hydraulic fluid has been tested for swell against these two polymers, not presently used for making specification O-Rings, whereas O-Rings are made from Perbunan 18 and tested for swell against this fluid. It is understood this situation is being rectified by also using a standard rubber made

TABLE I—SWELLING OF VARIOUS SYNTHETIC RUBBERS WITH VARIOUS HYDRAULIC OILS.

(Parts by Weight)

Recipe Number	A	B	C	D
Hycar OR-15	100	—	—	—
Perbunan 18	—	100	—	—
Butaprene NF	—	—	100	—
Neoprene FR	—	—	—	100
Phenylbetanaphthylamine	1	—	—	2
Zinc oxide	5	5	5	—
Stearic acid	1	1	1	1
Sulfur	1.5	1.5	1.5	1
Semi-reinforcing furnace black	60	—	—	—
Medium processing channel black	—	75	75	75
Benzothiazyl disulfide	1.5	1.5	1.5	—
Litharge	—	—	—	10
Cure, Min. at 310° F.	30	34	20	15
Original Physical Properties				
Tensile strength, lbs./sq. in.	3110	3470	1870	2450
100% stress, lbs./sq. in.	850	770	320	1900
Elongation, %	330	340	400	125
Physical Properties after Oil Aging 7 Days at 158° F.				
AN-VV-O-366B Fluid, Supplier A				
Tensile strength, % change	+ 1	—40	—16	—51
100% tensile stress, % change	—40	+75	+45	—
Elongation, % change	+21	—41	—39	—36
AN-VV-O-366B Fluid, Supplier B				
Tensile strength, % change	— 7	—34	—20	—61
100% tensile stress, % change	— 8	+ 9	+28	—
Elongation, % change	— 7	—32	—34	—44
Hydrolube, U-4				
Tensile strength, % change	— 4	—31	+11	—12
100% tensile stress, % change	+53	+43	+126	0
Elongation, % change	—42	—68	—41	—12
Per Cent Volume Change After Oil Aging 7 Days at 158° F.				
AN-VV-O-366B, Supplier A.	+4.5	+21.6	+15.8	+31.3
AN-VV-O-366B, Supplier B.	+3.3	+25.1	+17.4	+33.1
Low swell oil PRL 2557*	0.0	+19.9	+15.8	+26.0
High swell oil PRL 2558*	+3.8	+22.5	+15.8	+34.9
Hydrolube, U-4	+3.8	+ 6.1	+10.8	+ 3.0

* Special reference oils prepared by the Petroleum Refining Laboratory, Pennsylvania State College.

from Perbunan 18 to control the swelling limits of the fluid. Doubtless an appreciable amount of the swelling limits of both the fluid and the rubber can be attributed to variations in the standard rubbers and standard fluids used for the swelling tests. A controversy has existed for some time between the rubber packing manufacturers and the hydraulic oil suppliers over which one is responsible for the variation in the swelling of rubbers in hydraulic oil.

Hydrolube is another type of aircraft hydraulic fluid *(29)* and introduces additional packing problems. Having a base of ethylene glycol, it has swelling properties differing from petroleum-base fluids. It is anticipated that nonflammable hydraulic fluids now being developed will alter the swelling and other physical properties of the present O-Ring packings and might necessitate a change to another type of polymer than Perbunan 18.

The effects of several different hydraulic fluids on several different synthetic rubber compositions are shown in Table I. It can be seen readily that both the choice of the polymer and the fluid have pronounced effects on physical properties and on swelling. It should be noted that neither the Perbunan 18 nor the Butaprene NF stocks have an antioxidant added, which accounts in part for the lower physical properties obtained after oil aging. Data for Hycar OR-15 are included in this table for orientation, inasmuch as a large amount of swelling information concerning this rubber is already available in the literature. It would not be satisfactory for aircraft hydraulic packings, because of its relatively poor low-temperature properties.

The Vulcanizing System: The O-Ring properties which should be sought in the selection of a vulcanizing system are: no corrosion or adhesion of the O-Ring to metal surfaces, high resilience, low permanent set, and good aging without heat hardening. It is not considered likely that swell can be appreciably controlled by the vulcanizing system. It must be understood, however, that a full cure must be obtained in any case, because rubber is much more readily swelled in the partially vulcanized state *(5)*.

It has been found that O-Rings compounded with normal amounts of elemental sulfur tend to corrode metal surfaces. It has therefore been found desirable to use either very small amounts of this curing agent or eliminate it entirely. When vulcanization is accomplished by this general method, sulfur-releasing accelerators may be used to supply sulfur for vulcanization. For this purpose thiuram sulfide type ultra-accelerators have been used by previous investigators *(19)* and in this laboratory with quite satisfactory results. This type of cure also gives better permanent set characteristics than those obtained by the conventional sulfur-type cure. One disadvantage is that the stocks tend to be somewhat scorchy, because of the high accelerator level required, and therefore must be handled carefully in processing.

A typical recipe for a sulfur-releasing accelerator system is shown in Table II. It should be noted that stearic acid has been omitted from this recipe and that a zinc oxide level of 10 parts was used. With one part stearic acid added, practically identical results were obtained, and therefore there appeared to be no advantage in its use. Without zinc oxide, no cures were obtained, and it therefore appeared desirable to keep the zinc oxide content at a fairly high level.

It is possible that satisfactory nonsulfur vulcanization might be obtained with one of a number of curing agents which contain no sulfur. In the literature there are references to numerous materials which might be suitable for this purpose, such as selected metallic oxides, organic benzoyl peroxides, amines, phenols, polyhalogenated compounds, and diazoamino-benzene *(1, 15, 23, 25, 26)*.

Reinforcement: The primary purposes of reinforcing agents in an O-Ring are to improve tensile strength, tensile stress (modulus), tear and abrasion resistance, and to impart the desired hardness. Of these properties the desired hardness (which is a convenient measure of relative stiffness) is considered by O-Ring manufacturers to be the most important because of its reported relation to the extrusion failure of O-Rings in service.

The procedure which has commonly been employed to obtain a minimum O-Ring durometer hardness reading of 68, and to maintain low-temperature flexibility at the same time, is to adjust alternately the carbon black and the plasticizer contents of the stock. It is a well-known fact that varying amounts of different types of carbon black are required to achieve the same degree of hardness. It is also known that the swelling properties of a rubber are related to the nonswelling portions of the rubber stock, of which carbon black is a typical example *(6, 16)*. Accordingly, alterations in type and amount of black alter the swelling properties of the rubber composition and may require other adjustments in the compound.

Attempts have been made to produce a superior

O-Ring by selecting carbon blacks to give particularly high stress-strain properties. However, it has not been indicated that particularly high physical properties of this type are related to service-type tests. In some instances it has been found that an apparently inferior compound in regard to these physical properties showed better results in service-type tests than some supposedly superior compounds. This is demonstrated by the data in Table III, showing stress-strain properties of some commercial O-Rings which have been accepted as meeting the requirements of Specification AN-P-79 and some which have not been accepted.

It has been suggested that tensile stress (modulus) is the best stress-strain property to use as a guide in producing an O-Ring which will meet the crush test. As the tensile stress approaches the tensile strength crack-type failures are more likely to occur. O-Rings with low tensile stress are readily distorted to a greater extent and failure is more apt to be from permanent set. It is believed that O-Rings should have good tear resistance, so that failure will not result from cut crack growth aggravated by torsional twisting forces in service.

Abrasion resistance is often obtained in rubber compounding by adding channel carbon black to the stock. This introduces a tendency for the stock to build up heat during processing, leading to the possibility of scorching, particularly with highly accelerated stocks. In addition, channel blacks do not flow easily and would tend to produce poorer molding stocks than the softer-type carbon blacks.

It is believed that no single carbon black can be used to meet all the O-Ring requirements. As is customary in such instances, a compromise can be made by blending several suitable carbon blacks which together meet the requirements. An example of such a blend is shown in Table II.

Plasticization: Plasticizers are selected for O-Ring compounding to perform three primary functions: First, to assist in making the O-Ring flexible at —65°F; second, to help adjust the swell of the O-Ring in hydraulic fluid; and third, to assist in processing, particularly molding. The first two functions are to be carried out despite the tendency for the plasticizer to be lost by the leaching action of hydraulic fluid and by volatilization at a possible operating temperature of 160°F. In general, materials which are high in permanence are of high molecular weight, with polymeric or resinous plasticizers being best in this respect. On the other hand, high molecular weight plasticizers are generally poor in plasticizing efficiency, particularly as compared to lower molecular weight plasticizers.

It has been previously stated that the base polymer is largely responsible for swell. The addition of compounding materials to the base polymer, which are not affected themselves by hydraulic oil, tends to produce a compounded stock with less swell than that of the base polymer alone *(17)*. This is accomplished by the simple act of dilution. Plasticizers which have high permanence reduce swell to a limited extent in this manner, although many are swollen by the hydraulic oil themselves and may tend to increase the swell of the stock. However, with plasticizers which are readily extracted the effect on swell is much more pronounced and complicated. The swelling of such stocks follows along these lines:

(1) The hydraulic oil enters the rubber and produces an optimum amount of swell within a relatively short time, i.e., within several days. During this period, the extraction of the plasticizer has been initiated but no appreciable loss has taken place.

(2) As extraction of the plasticizer progresses, there is a reduction in the swell of the rubber, which may eventually lead to an actual shrinkage as based on the original volume. A portion of the extracted plasticizer will be replaced concurrently by the hydraulic oil, which then acts as a plasticizer. Only a limited amount of hydraulic oil will be taken up by the rubber stock, depending on its compatibility with the stock. If the volume of the hydraulic oil absorbed is less than that of the plasticizer extracted, then the difference will represent the amount of shrinkage of the stock.

(3) Hydraulic oil contaminated with plasticizer may lead to unusual swelling problems, depending on the plasticizer and the extent of the contamination.

(4) Final equilibrium is reached only after many weeks' extraction. The net swell may be either positive or negative, depending largely on the base polymer and the kind and amount of plasticizer employed.

In adjusting the swelling of an O-Ring in hydraulic oil, a combination of plasticizers may be used to advantage. For example, a plasticizer which is high in permanence, such as a resinous polyester, may be combined with a plasticizer which is extractable by hydraulic oil, such as triethylene glycol dicaprylate, to obtain amounts of swell intermediate between those obtained with either one of these plasticizers. A typical swelling curve for a vulcanizate obtained with the stock whose recipe

TABLE III—ORIGINAL PHYSICAL PROPERTIES OF SEVERAL COMMERCIAL O-RINGS

	Tensile Strength (Lbs./Sq. In.)	100% Tensile Stress (Lbs./Sq. In.)	Ultimate Elongation (Per Cent)
Acceptable Compounds *			
A	1280	585	170
B	1240	590	165
C	1350	495	195
Unacceptable Compounds *			
D	1925	510	320
E	1045	580	150
F	1230	560	165

* Status of compounds based on complete AN-P-79 tests and not on stress-strain properties.

TABLE II—TYPICAL RECIPE INVOLVING SULFUR-RELEASING ACCELERATOR SYSTEM (RECIPE NUMBER E).

(Parts by Weight)	
Perbunan 18	100.0
Phenylbetanaphthylamine	2.0
Zinc Oxide	10.0
High-Modulus Furnace Black	25.0
Semi-Reinforcing Furnace Black	90.0
Resinous Polyester (Paraplex G-25)	10.0
Triethylene Glycol Dicaprylate (Plasticizer SC)	15.0
Dipentamethylene Thiuram Tetrasulfide (Tetrone A)	1.5
Tetramethyl Thiuram Disulfide (Tuads)	1.5
Cure at 290° F., Min.	45
Tensile Strength, Lbs./Sq. In.	1900
100 Per Cent Tensile Stress, Lbs./Sq. In.	875
Elongation, Per Cent	180
Hardness, Durometer (Rex)	73

is shown in Table II is presented in Figure 3. Note the initial maximum increase in volume, and then a gradual reduction in swelling with time.

In selecting a plasticizer for O-Rings, consideration must be given to processing problems. Probably the main processing problem is in reducing the number of rejects. Failure of some stocks to flow and knit properly during curing have resulted in many cases in an excessive number of flow crack type rejects. This type of reject can often be traced back to the choice of plasticizer system. Other processing problems which might be associated with the choice of plasticizers are difficulties experienced in milling and stock preparation. Some stocks have been found to produce satisfactory O-Rings by extruding and bias splicing the stock for mold loading *(9)*.

Another plasticizer requirement which is somewhat obvious is that it should not be corrosive to metals. This includes the possibility that it might hydrolyze or readily decompose into reaction products which are corrosive to the metal components of the hydraulic system.

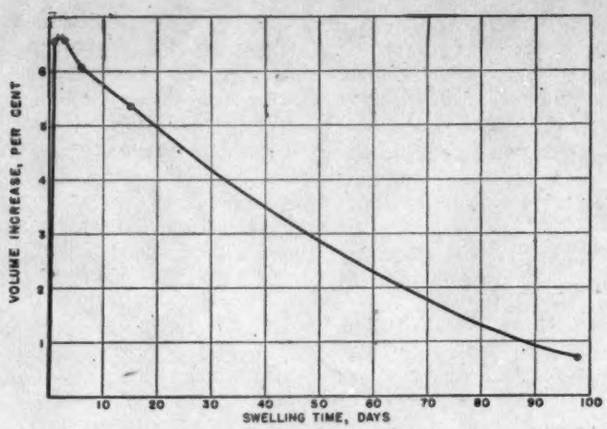

FIG. 3—Effect of swelling time on volume increase of a Perbunan 18 vulcanizate (recipe shown in Table II).

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American Pulley Speed Reducer

A vertical speed reducer, offering wide application in the process industries, was recently introduced by the American Pulley Co., 4200 Wissahickon Avenue, Philadelphia 29, Penna. Features which make it especially useful are (1) light weight, the vertical reducer weighs only ½ to 1/3 as much as comparable units, and (2) low headroom requirements. Because little headroom is needed, the speed reducer is well adapted to such process industry operations as agitation, homogenization, paddle mixing, and beating.

An economical feature of the new unit is its use of stock parts. It will provide any driven speed below 154 rpm from standard stock parts and, for the first time, offers a vertical speed reduction drive at a cost only slightly higher than that of a horizontal speed reduction drive. The new vertical drive is easy to install. The unit is built to mount right on the shaft of the driven machine, as easily and quickly as a pulley. No costly supports or special foundations are needed. The drive can be selected and installed from simple catalog information. This eliminates delays or production losses ordinarily encountered when a custom-ratio reducer is assembled at the factory.

Other advantages are: (1) Quick speed changes; pulleys or sheaves of different diameters can easily be substituted in the primary belt drive, or standard adjustable-diameter sheaves can be used, (2) Easy change of location; interchangeable bushings permit the new reducer to be adapted to shafts of various sizes, and (3) Quiet operation; precision machinery and careful construction reduce noise to a minimum.

High Styrene Resins in Rubber Compounding

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THE modified polystyrene resins comprise a class of novel, vulcanizable, organic reinforcing and processing agents that are finding widespread use in rubber compounding. These resins are essentially copolymers of styrene and selected diolefins with the styrene predominating.

The high styrene resins were introduced to the rubber industry early in 1942 after pilot plant studies in the previous year by the Marbon Corporation indicated their use as processing aids and reinforcing agents for the synthetic rubbers. It was during this period that the synthetic rubber program was being accelerated to meet the demands normally supplied by natural rubber.

The need for reinforcing agents, possessing low specific gravities, low moisture absorption and good dielectric properties, was soon indicated by the new applications demanded of these synthetic elastomers, particularly in the formulation of high frequency insulation stocks. To meet these needs, two high styrene copolymers Marbon S and S-1 *(1)* were introduced to the rubber industry. The performance of these resin polymers in these new rubbers was outstanding.

The literature on the high styrene resins in compounding has been appearing of late *(2)* and indications are that this will be a fertile field for future investigation.

Classification of Organic Reinforcing Agents

The use of organic reinforcing and processing agents in rubber compounding is not new. Hard asphalts, shellac, rosin, glue and coumarone resins have been used variously to improve processability and (or) impart reinforcement in rubber compounding *(3)*. The use of plastics in the rubber industry has been well summarized by Winkelmann *(4)*.

Organic reinforcing agents may be defined as organic substances usually of high molecular weight which are compatible with the rubbers, being at least initially thermoplastic in character, and possessing varying degrees of unsaturation and (or) reactivity. These reinforcing agents may be conveniently classified into three general groups according to their respective behavior during vulcanization:

Note: This paper was presented before the Division of Rubber Chemistry, A.C.S., Chicago, Ill., April 23, 1948.

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TABLE I—QUALITATIVE EFFECT OF ORGANIC REINFORCING AGENTS IN GR-S GUM STOCKS

Reinforcing Agent	Modulus	Tensile	Elongation	Hardness	Stock Stiffness
Class I.....	Decreases	Variable	Increases	Variable	Intermediate
Class II....	Increases	Increases	Decreases	Increases	High
Class III*..	No effect	No effect	No effect	Increases	Low

* Show adequate reinforcement with carbon black in stock *(4)*.

TABLE II—PROPERTIES OF COMMERCIAL HIGH STYRENE COPOLYMERS

Resin	Volatile[1] %	Heat Distortion °C.	Ash %	Rupture Strength Lbs. Mullen	Dielectric Properties at 1 Megacycle D.C.	Dielectric Properties at 1 Megacycle % P.F.	Iodine No.[2]
A	0.96	51	0.47	135	2.66	0.22	46.0
B	0.62	61	0.10	70	2.59	0.07	54.0
C	0.66	40.5	2.38	186	2.81	0.20	66.0
D	0.73	48	0.35	190	2.68	0.20	62.0
E	0.46	51	1.20	221	2.57	0.10	68.0
F	0.0	83	0.58	345	2.63	0.20	85.0
G	0.85	65.5	0.44	80	2.73	0.07	53.0
H	0.50	51	0.13	249	2.55	0.24	46.0
I	0.35	50	0.24	170	2.50	0.07	45.0

[1] 30 minutes @ 200° C. [2] Values for unextracted resins.

Group I. Thermoplastic resins predominately saturated or containing substantially non-reactive unsaturation under the curing conditions. The terpene resins, coumarone-indene resins, and certain rosin derivatives are examples of this group. These products may be considered as heat sensitive plasticizers at temperatures above their softening point and reinforcing plasticizers at temperatures below their softening range.

Group II. Thermoplastic resins which contain active unsaturation and which show curing tendencies under normal vulcanizing conditions. The modified styrene resins described here fall in this group.

Group III. Phenol-aldehyde resins which are initially thermoplastic and which show some condensation or thermosetting characteristics under the curing conditions to which the stock is subjected. Resins belonging to this group are reputed to serve as curing agents for certain rubbers as well *(5, 6)*.

The behavior of these classes of resins in a GR-S gum stock is shown qualitatively in Table I. In general, Group I resins act as true plasticizers *(7)*; those of Group II act as true reinforcing agents; and Group III resins show little reinforcement in non-loaded GR-S stocks *(4)*.

Properties of Commercial High Styrene Resins

The widespread use of high styrene copolymer resins in rubber compounding is emphasized by the number of such resins appearing on the market. These resins have in common a styrene content in excess of 70%, otherwise they differ in the following respects: type of diolefin, soap content and type, modifiers, catalysts, and methods of polymerization, coagulation, and drying.

The data on nine typical commercial high styrene resins are summarized in Table II. The heat distortion point is reported as the temperature at which a bridge of the resin of dimensions 1-inch x 4-inch x 0.04-inch collapses when carrying a 30 gram load midway between

TABLE III—PROPERTIES OF MARBON S AND S-1 RESINS

Property	Marbon S	Marbon S-1
Tensile Strength, p.s.i.	5,400	4,800
Flexural Strength, p.s.i.	8,000	6,900
Impact Strength, Notched Izod ft. lb. per inch	0.34	0.28
Hardness, Shore "D"	87	87
Dielectric Strength, 80% Rel. Humidity V/mil.	925-1010	1040-1060
Volume Resistivity, ohms/cm³	1×10^{15}	1×10^{15}
Power Factor (1 megacycle)	0.002-0.003	0.0003-0.0007
Dielectric Constant (1 megacycle)	2.5-2.8	2.5-2.8
Specific Gravity	1.05	
Ash, % by weight	0.47	
Resistance to Solvents		
Dilute acids and alkalis	Good	
Alcohols	Good	
Hydrocarbons (aliphatic)	Fair	
Hydrocarbons (aromatic)	Poor	
Ketones	Poor	
Chlorinated Solvents	Poor	

the supporting edges. The rupture strength is the number of pounds required to rupture a sheet of molded resin 0.04 inch thick in a Mullen Tester.

More detailed properties of two typical high styrene resins—Marbon S and S-1—are shown in Table III.

Iodine determinations on these resins indicate they contain active unsaturation. Determinations by the Kemp-Peters method *(8)* give iodine values lying between 45 and 85. These values correspond to between 14 and 28% of the unsaturation of GR-S.

Economics of the Resins in Compounding

The production of high styrene resins has shown a phenomenal growth since their introduction in 1942. The production of these resins in 1947 is estimated at 12 million pounds. The indications are that this figure was doubled in 1948. The bulk of these resins are used in rubber compounding although their uses in other fields are indicated by their unique properties.

The prominence of these resins as reinforcing agents for rubbers is clearly shown by the recent appearance on the market of about nine such resins supplied by at least a half dozen manufacturers. These resins differ as noted in a previous section of this paper.

In the compounding of high durometer stocks with carbon black and inorganic fillers, difficult processing is often encountered which is characterized by a dryness of the stock, manifesting itself in poor molding and flowing characteristics during cure. This results in some of the more obvious faults in the cured stock, as for example backrinding and inclusion of trapped air. The use of the high styrene resins is particularly indicated in such stocks as processing aids because of their thermoplastic properties prior to cure. After the cure, they serve to accentuate the stiffness and hardness of the stock and thus complement the action of the normal fillers.

The compatibility of the high styrene resins with natural and synthetic rubbers results in the improvement of the processing of the stock and effectively cuts down shrinkage, both of which properties are desirable in calendering.

In addition to these factors, the use of Marbon S-type resins permit more efficient scrap control in the mill room by materially reducing the softening effect of remilling on unvulcanized compounded scrap.

The low gravity and high unit reinforcement efficiency of these resins in rubbers, particularly in compounding for high hardness, place the high styrene resins in the moderate price class of compounding ingredients.

Among the products in which these resins are enjoying wide acceptance are the following: shoe sole stocks, rubber floor tile, hard board stocks, gaskets, caster wheels, electrical insulation, hard rubber stocks, and mechanical goods in general.

Processing of the Resins

The high styrene resins in rubber compounding require no radically different handling technique over those employed for the usual compounding ingredients. They may be processed quite effectively in the conventional rubber processing equipment.

In using these resins, it is evident that to secure maximum reinforcement, the resin must be well dispersed in the rubber and, in addition, it must be thoroughly fluxed. Both of these conditions are obtained effectively by prior masterbatching of the resin with the rubber. In a Banbury mixer, masterbatching or the mixing of these stocks offers very little difficulty; the heat generated in the mixing being usually sufficient to flux the dispersed resin. On the rubber mill, in masterbatching or the mixing of stocks, the high styrene resin is first banded on a hot mill (150 to 160° F.) and the initial rubber is added slowly and in small portions until about 5% has been dispersed in the resin; the remainder of the rubber is then added at a faster rate with simultaneous cooling of the mill rolls. Compounding further from this point does not differ from the regular techniques used in conventional rubber stock mixing.

The early high styrene resins were obtained in fused,

TABLE IV—PARTICLE SIZE DISTRIBUTION OF SOME TYPICAL EASY PROCESSING HIGH STYRENE RESINS

High Styrene Resin	% Resin Held on Screen 40 Mesh	140 Mesh	200 Mesh	Through 200 Mesh
E. P. Marbon S	14.3	77.9	3.3	4.5
Resin No. 2	56.4	32.0	5.8	5.8
Resin No. 3	0.2	24.7	24.4	50.7

Note: Particle size was determined on 100 grams of resin balled in 1 quart ball mill for 30 minutes.

TABLE V—CURING CHARACTERISTICS OF HIGH STYRENE RESINS[1]

(Parts by Weight)

	A	B	C	D
Marbon S-1	100	100	100	100
Zinc Oxide	—	5	5	5
Sulfur	—	—	2	2
Cyclohexyl benzothiazyl sulfenamide	—	—	—	1.5
Properties[2]				
Tensile Strength, p.s.i.	3770	5240	5470	5690
Rupture Strength, lbs.[3]	105	150	165	180
Heat Distortion, °C.	54	57.5	64.5	60
Shore "D" Hardness	81	82	83	84
Surface Shrinkage, %	25	8	6	3.5
Solubility in Toluene	Soluble-gel	gels	swells	swells

[1] All stocks milled same length of time. [2] All stocks cured 15 min. at 320° F., then cooled in press for all determinations but shrinkage. [3] On sheet 0.04-inch thick with Mullen Tester.

TABLE VI—MARBON S AND S-1 IN TEST RECIPES
(Press Cure: 20 min. @ 307° F.)

	A	B	C
GR-S	100–10		
GR-A		100–30	
Smoked Sheet			100–70
Marbon S	0–90	0–70	
Marbon S-1			0–30
Antioxidant			1
Zinc Oxide	5	5	3
Stearic Acid	1	1	1
Sulfur	2	1.5	3
Benzothiazyl disulfide	1.5	1.5	1
Cupric diethyl dithiocarbamate	0.1		

granular form. This necessitated banding of the resin on a hot mill prior to the incorporation of the rubber. Recently it has been found that when these resins are obtained in the form of an unfused powder or agglomerate, they can be dispersed directly in the rubber on a cold mill. Fluxing may then be achieved by raising the mill temperature to approximately 200° F.; or, in highly filled stocks, fluxing may be obtained by the normal frictional heat developed during the milling of the inorganic fillers. Such resins have been designated as easy processing.

A number of the commercial high styrene resins are available in this so-called easy processing form. The obvious disadvantages to resins in this form are the presence of appreciable amounts of fused particles and (or) the excessive resin fines present in the product. Both of these conditions present some production problems.

The new Easy Processing Marbon S and S-1 resins are unique in that they are relatively free of coarse fused particles and fines. By a novel manufacturing process these resins are obtained as non-fused, porous, friable granules of uniform size. They resist disintegration by normal mechanical handling but are readily reduced to a powder on the mill. The data on particle size distribution after mild mechanical treatment of E. P. Marbon S and several commercial high styrene resins are shown in Table IV. The differences in particle size distribution of these resins is quite apparent.

Curing Characteristics

In Table V are shown the data on the effect of conventional rubber curing ingredients on Marbon S-1 resin. The transformation of the properties of the resin with each added ingredient appears to suggest a condition analogous to curing or vulcanization encountered in rubber technology. Hence it appears that the reactive unsaturation of these resins, mentioned earlier in this paper, is vulnerable to vulcanizing agents.

Direct evidence for the intervulcanization of high styrene resins and rubbers in blended compositions of these materials is difficult to ascertain. However, collateral evidence from compounding studies appears to indicate the presence of some attractive forces between these materials in the cured stocks.

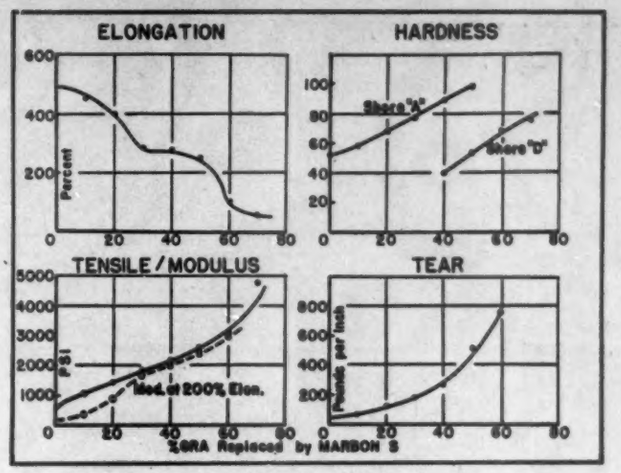

Fig. 2—Marbon S in GR-A Gum Stock.

Reinforcement Characteristics

The high styrene resins are compatible with most of the synthetic rubbers and with natural rubber. Work with Marbon S and S-1 indicates that these resins are compatible practically in all proportions with GR-S, GR-A (nitrile rubber) and GR-M (chloroprene rubber), but show only limited compatibility (approximately 10%) with GR-I (butyl rubber). These resins are likewise compatible with natural rubber and satisfactory stocks have been compounded containing 45% by weight Marbon S on the rubber.

The recipes used in evaluating the high styrene resins

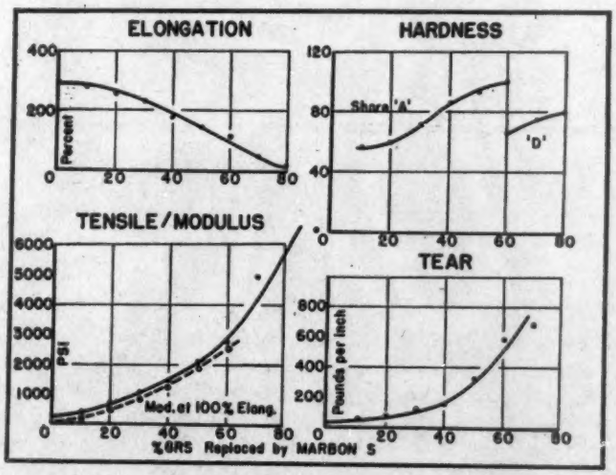

Fig. 1—Marbon S in GR-S Gum Stock.

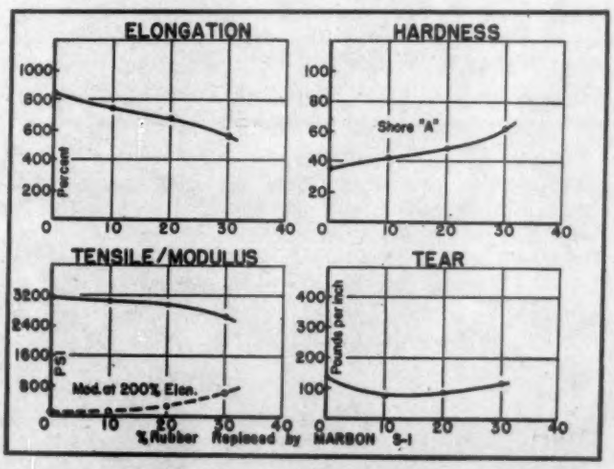

Fig. 3—Marbon S-1 in Natural Rubber Pure Gum Stock.

TABLE VII—EFFECT OF MARBON S ON CALENDER SHRINKAGE OF GR-S STOCK[1]

% Marbon S in Stock	Comparative Shrinkage Values[2]
0 (blank)	100
10	93
20	65
40	50
60	30

[1] Base Stock, Recipe A, Table 6. [2] Cold mill shrinkage on equivalent weights of stock.

in the synthetic rubbers and natural rubber are shown in Table VI.

In Figure 1 are shown the data on the reinforcing action of Marbon S on a pure gum GR-S stock of formulation shown in Table VI. In this study the GR-S is progressively replaced by increasing increments of Marbon S up to 90% replacement. The reinforcement of the GR-S is quite apparent by the increased hardness values and resistance of the stocks to stresses. The decrease in shrinkage of the GR-S gum stock with increasing amounts of Marbon S is shown in Table VII.

The data for the reinforcement of a GR-A gum stock by replacing the GR-A with increasing increments of Marbon S are shown in Figure 2 for the recipe given in Table VI. The reinforcement characteristics of Marbon S are quite evident. The particular GR-A rubber used had an acrylonitrile content of approximately 35%. Marbon S is extremely compatible with the acrylonitrile rubber giving translucent blends in all proportions in the uncured state. This compatibility appears to increase with increasing acrylonitrile content of the rubber.

In Figure III are given the reinforcing data for smoke sheet pure gum stock with increasing increments of Marbon S-1 replacing the rubber (Table VI). A 30% replacement of rubber by Marbon S-1 corresponds to approximately 43% by weight of the resin on 100 parts by weight of rubber. The reinforcing action of the resin is evident in the hardness and modulus measurements of the stock. The tensile and tear values do not seem to be affected appreciably.

High Styrene Resins-GR-M Uncured Blends

The high styrene resins show excellent compatibility with GR-M. The data in Table VIII show the properties of Marbon S-1-GR-M uncured blends in stocks containing up to 80% resin. The general reinforcement properties are obtained and in addition the dielectric properties of the GR-M are improved quite significantly with increasing amount of the high styrene resin in the blend. This reinforcement is also manifest in cured blends of Marbon S-1-GR-M.

TABLE VIII—PROPERTIES OF UNCURED MARBON S-1-GR-M BLENDS

% GR-M Replaced by Marbon S-1	Tensile p.s.i.	Ultimate Elongation, %	Tear, Lbs./in.	Hardness Shore A	Dielectric Properties (at 1 megacycle) D.C.	%P.F.
0	840	1070	30	44	—	—
10	820	910	20	60	—	—
20	1210	535	82	73	4.85	1.085
30	1295	450	86	85	4.53	0.614
40	1514	500	114	95	3.99	0.538
50	2070	425	201	98	3.79	0.364
60	2110	130	222	99	3.50	0.304
70	3330	35	337	100	3.44	0.256
80	4210	0	348	100	2.97	0.164

Summary

High styrene resins possessing active unsaturation are compatible with natural and synthetic rubbers and serve as effective reinforcing agents for these rubbers.

Their low specific gravities, high unit volume reinforcement characteristics, light color and good dielectric properties place them in a competitive position with other rubber reinforcing agents and permits greater latitude in compounding for specific uses.

The thermoplastic characteristic of these resins in unvulcanized stock improves processing and in general minimizes calender shrinkage. The high styrene resins permit more efficient reworking of scrap in the mill room. All of these factors tend to increase production efficiency.

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(6) Van der Meer *Rec. trav. chim.*, Vol. 63, p. 147 (1944).
(7) Bulletin BL-122, Sept. 30, 1943, Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Wilmington 98, Delaware.
(8) Kemp, A. A., and Peters, H., *Ind. Eng. Chem., Anal. Ed.*, Vol. 15, pp. 453-59 (1943).

An improved product in its materials handling line is the **open-side pallet-rack** now being produced by the Union Metal Manufacturing Co., of Canton, Ohio. The unit combines the best features of both pallet and rack and can be used to tier unit loads of odd shapes and sizes. It is available for both light and heavy loads.

The first in a series of **special-attachment work-savers** designed to perform odd handling jobs peculiar to particular industries has been introduced by the Yale & Towne Manufacturing Co., Philadelphia, Pa. Called the "Bunnyhugger," this first unit makes it possible to handle certain types of commodities without the use of skids or pallets.

A new **150-ton fully automatic molding press** for high production of a wide assortment of conventional plastic parts has been announced by the F. J. Stokes Machine Co., Philadelphia, Penn. It is provided with a unique and positive checking device to control the automatic action of the press through the ejected part. Positive ejection is accomplished through a separate ejection cylinder.

Neoprene AC-Resin Cements

By GROVER S. RAMSEY* and GEORGE I. PETELIN

Goodyear Rubber Co., San Francisco, Calif.

THE problem of a simple one-application cement for the adhesion of cured rubber sheet, either natural or synthetic, to metal and other surfaces has been one of the rubber manufacturers' main difficulties. One cement developed for this purpose has been the combination of Neoprene AC with a resin, usually a phenolic, dissolved in a suitable solvent. Perhaps the most used resin is a thermoplastic terpene phenolic.

The purpose of this paper is to compare this resin with some similar phenolic resins, and also to present some of the data obtained with the use of a pure phenolic, which was found to give comparable results in all cases to the terpene phenolic and superior results in some cases. The thermoplastic terpene phenolic tested was a product of Durez Plastics & Chemicals, Inc., while the other phenolics were those supplied by Reichhold Chemicals, Inc.

In all tests, the procedure for mixing the cement was the same. The neoprene was broken down on a tight laboratory mill for fifteen minutes. It was then weighed and dissolved in toluene. The proportion used was 75 grams of neoprene in 100 cc of toluene. The resin was powdered, weighed, and dissolved in methyl ethyl ketone. The same weight-volume ratio was used as with the neoprene solution. The two solutions were then mixed to give the proper concentration of resin to neoprene. However, since the purpose of the experiment was to find a cement which could be prepared and used by the factory worker in the plant or on the job in the field, not too much care was taken to obtain and maintain exact proportions and additional solvents were added as necessary for thinning purposes.

Since there is a possibility of this type of cement being applied in the field by untrained personnel, the preparation of the test surfaces to be cemented consisted of merely washing clean with solvent. The cement was applied by brushing and only a uniform coating was desired. One coat of cement was applied to each surface to be bonded.

Tests were conducted on ordinary vulcanized factory stocks, 40 to 60 Shore in hardness. No attempt was made to compound stocks to give improved adhesion. The stocks tested were: natural rubber, neoprene, GR-S, Buna-N, butyl, and Thiokol PR-1. In addition to cementing the rubbers to themselves, adhesions to sheet tin, wood, and cotton duck also were tested.

In comparing the resins to the thermoplastic terpene phenolic, a solution of 75 parts resin to 100 parts neoprene in sufficient solvent for smooth application was used. A cement of neoprene without resin was also tested to determine the effect of the resin.

In all cases, the cements were allowed to dry tack free of solvents before bonding the surfaces, and a forty-eight hour aging period allowed before testing. All tests were conducted at room temperature throughout the entire test. Bond strengths were determined as stripping values on the Scott tester following the procedure recommended by ASTM.

The following resins were tested against the thermoplastic terpene phenolic:

1400 Phenolated copal
1112 Modified phenolic
1113 Modified phenolic
1123 Modified phenolic
1124 Modified phenolic
1001 Pure phenolic

Table I gives the results obtained in cementing strips of the same stock together. Tables II, III, and IV give the adhesion of the stocks (expressed in lbs. per inch of width for separation at 1 inch per minute) when cemented to sheet tin, wood, and cotton duck.

By scraping the coated tin and wood surfaces with a sharp knife, the coating adhesion of the resin cements were tested. Terpene phenolic and pure phenolic coating were good. The adhesions of the other resins were fair with the exception of phenolated copal and neoprene alone which are poor.

As the results of these tests indicated that the cements of pure phenolic were equal or superior to the cements of thermoplastic terpene phenolic, and that the cements of the other resins were inferior, work was continued on pure phenolic cements.

Note: This paper was presented at the 53rd Meeting of the Division of Rubber Chemistry, A.C.S., Los Angeles, Calif., July 22-23, 1948.

* Present address: Grove Regulator Co., Oakland, Calif.

TABLE I—RUBBER TO RUBBER

Cement	Smoked Sheet	Neoprene	Buna N	Thiokol	GR-S	Butyl
AC	1.5	18.0	1.0	1.0	2.5	1.5
Terpene Phenolic	2.5	14.0	2.5	7.5	2.0	8.0
1400	2.0	2.5	1.5	1.5	2.0	1.5
1112	2.0	2.0	1.0	1.5	1.5	3.0
1113	1.5	2.0	1.5	2.0	1.5	2.0
1123	2.5	1.5	2.0	2.0	2.0	1.5
1124	1.5	2.0	2.0	2.5	1.5	1.5
Pure Phenolic	3.5	12.5	6.5	7.5	4.5	7.0

TABLE II—RUBBER TO TIN

Cement	Smoked Sheet	Neoprene	Buna N	Thiokol	GR-S	Butyl
AC	1.5 a	2.5 b	2.5 c	2.0 c	1.5 c	2.0 c
Terpene Phenolic	11.0 a	15.0 b	3.0 a	13.0 c	2.0 a	10.0 a
1400	2.0 c	5.0 c	1.5 c	2.0 c	2.5 c	3.0 c
1112	6.0 a	7.0 a	2.0 a	2.5 a	2.5 a	5.0 a
1113	2.0 a	5.0 a	2.0 a	2.0 a	2.5 a	2.0 a
1123	4.5 a	5.0 a	1.5 a	2.0 a	1.5 a	2.0 a
1124	2.0 a	2.0 a	1.5 a	2.0 a	1.5 a	2.0 a
Pure Phenolic	13.0 a	17.0 a	12.5 a	13.0 a	7.5 a	10.0 a

a, failure at rubber surface; b, failure at tin surface; c, failure at both surfaces.

TABLE III—RUBBER TO WOOD

Cement	Smoked Sheet	Neoprene	Buna N	Thiokol	GR-S	Butyl
AC	1.0 c	2.0 b	1.5 c	1.5 c	1.0 c	1.0 c
Terpene Phenolic	1.5 a	10.0 a	7.5 a	4.5 a	1.5 a	5.0 a
1400	1.5 c	1.5 b	1.5 c	1.5 c	1.0 c	1.0 c
1112	2.0 a	2.0 a	1.5 a	1.5 a	2.0 a	2.0 a
1113	1.5 a	2.5 a	3.5 a	3.5 a	1.5 a	2.0 a
1123	1.5 a	2.0 a	2.0 a	2.5 a	1.5 a	2.5 a
1124	2.0 a	2.5 a	2.0 a	2.0 a	1.5 a	2.0 a
Pure Phenolic	2.5 a	6.0 a	8.0 a	7.5 a	3.5 a	6.0 a

a, failure at rubber surface; b, failure at wood surface; c, failure at both surfaces.

The concentration of resin and neoprene was changed as follows:

Cement 1	50	parts pure phenolic
	100	parts neoprene
Cement 2	100	parts pure phenolic
	100	parts neoprene
Cement 3	150	parts pure phenolic
	100	parts neoprene
Cement 4	200	parts pure phenolic
	100	parts neoprene

Again, the possibility of use on the job was kept in mind, and the amount of solvent was adjusted to give a suitable, easy-to-apply cement.

Tables V and VI give the results obtained in adhesion to self and to sheet tin for each stock. The same compounds were again used as in the comparison tests.

The results indicate that a 50-part resin to 100-part neoprene cement gives the best adhesion. However, knife scraping of the cement coating on the tin indicates that the coating bond is optimum with a 100-part resin to 100-part neoprene cement. For a comparison of results obtained by varying the thermoplastic terpene phenolic and neoprene concentrations, reference is made to the progress report "One Shot, Neoprene Adhesive Cements for Adhesion to Metal and Other Surfaces," issued by the DuPont Rubber Chemicals Division.

The tests show that good bonding is obtained to the metal, wood, and duck, but that failure occurs in the bond to the rubber surface in almost every case. This failure at the rubber surface is especially bad in the cases of natural rubber and GR-S. Care should be taken in adhesion operations with these two rubbers if it is necessary to use more than one ply to obtain the desired thickness. The danger of failure at the rubber surface may be lessened by the use of calendered sheet stock which has been cured in a liner, instead of the smooth molded sheets which were used throughout the present tests.

TABLE IV—RUBBER TO DUCK

Cement	Smoked Sheet	Neoprene	Buna N	Thiokol	GR-S	Butyl
AC	3.5 a	14.0 c	4.5 a	4.0 a	3.5 a	4.5 a
Terpene Phenolic	10.0 c	4.5 c	5.0 a	10.0 c	1.5 a	3.5 a
1400	1.5 a	2.0 a	1.5 a	2.5 a	1.5 a	2.0 a
1112	1.5 a	2.5 a	1.5 a	2.5 a	2.0 a	1.5 a
1113	2.0 a	2.0 a	2.0 a	1.5 a	2.0 a	2.0 a
1123	1.5 a	3.5 a	3.5 a	2.0 a	1.5 a	1.5 a
1124	2.0 a	3.0 a	3.5 a	3.5 a	2.0 a	1.5 a
Pure Phenolic	4.0 a	5.0 a	5.5 a	10.0 a	5.0 a	5.5 a

a, failure at rubber surface; b, failure at duck surface; c, failure at both surfaces.

TABLE V—ADHESION TO TIN

Cement	Smoked Sheet	Neoprene	Buna N	Thiokol	GR-S	Butyl
1	9.0a	15.0 c	10.0 a	13.5 a	4.0 a	7.0 a
2	4.0 a	13.5 c	7.5 a	5.5 a	6.0 a	4.5 a
3	2.5 a	9.5 c	2.5 a	2.0 a	2.5 a	3.0 a
4	1.5 a	6.0 c	2.5 a	2.0 a	1.5 a	1.5 a

a, failure at ruober surface; b, failure at tin surface; c, failure at both surfaces.

TABLE VI—RUBBER TO RUBBER

Cement	Smoked Sheet	Neoprene	Buna N.	Thiokol	GR-S	Butyl
1	3.5	9.0	4.0	6.0	4.0	6.0
2	1.5	7.5	5.0	5.5	2.5	4.0
3	2.0	3.5	5.5	2.5	1.5	2.5
4	1.5	2.0	3.0	2.0	1.0	1.5

The best results in both adhesion and strength of bond were secured with neoprene stocks; with these stocks it should be possible to ply up sheets of stock to obtain the desired thickness.

Before using this type of cement in any application, care must be taken to determine the use of the product. Any commercial solvent which has a solvent action on either the neoprene or the resin will weaken or destroy the bond. Also, high temperature will soften the cement. As no tests have been made, it is impossible to state what this softening temperature is.

Several projected experiments are being planned. These include: (1) the adding of a curing agent to the neoprene to lessen the danger of solvent action on the finished product; (2) the use of specially compounded stocks to secure better adhesion to the rubber surface, and (3) the adding of reinforcing agents to the neoprene to increase the modulus.

Merit High Pressure Valves

Valves providing for shockless operation, rapid servicing, minimum frictional loss, and ready accessibility to all working parts are available in a complete line of diaphragm-actuated two-pressure Merit valves manufactured by Emmett Machine and Manufacturing, Inc., 2249 Fourteenth St., S. W., Akron 14, Ohio. Designed for a wide range of application in high presure hydraulic service, Merit valves range in size from 1 to 4 inches, and can be furnished for operation on systems having 3,000, 5,000, and 10,000 per square inch pressures. Variations of valve assembly provide for diaphragm controlled high-pressure inlet, diaphragm-controlled slow-travel valve, or diaphragm-controlled stop valve, all handled within one casting and with minimum pipe connections.

A feature of the valves is the interchangeability of seats and discs between main valve and check valve assembly. More than 50% of the interior working parts of the valves in this series will interchange with other size valves in the same series. The use of heat-treated Monel seats and discs in a sturdy bronze valve body assures maximum valve life and minimum maintenance.

Division of Rubber Chemistry, A. C. S., Meets in Atlantic City on September 21, 22 and 23

AS PREVIOUSLY announced, the Fall Meeting of the Division of Rubber Chemistry of the American Chemical Society will be held at the Chalfonte Haddon-Hall Hotel in Atlantic City, N. J., on September 21, 22 and 23, in conjunction with the 116th National Meeting of the parent society. The Division meeting will feature the presentation of 19 technical papers, a business meeting and the usual divisional banquet. A meeting of the 25-Year Club, under the chairmanship of John P. Coe (Naugatuck Chemical) is also scheduled to be held. Titles, authors and abstracts of the technical papers scheduled follow herewith:

Program of the

DIVISION OF RUBBER CHEMISTRY AMERICAN CHEMICAL SOCIETY

Chalfonte-Haddon Hall, Atlantic City, N. J. September 21-23, 1949

Wednesday Afternoon—September 21

2:00 P.M.—Introductory Remarks by Dr. Howard I. Cramer (Sharples Chemicals), Division Chairman.
2:10 P.M.—Technical Papers.

Thursday Morning—September 22

9:00 A.M.—Open Period.

Thursday Afternoon—September 22

2:00 P.M.—Technical Papers.

Thursday Evening—September 22

7:00 P.M.—Division Banquet, Chalfonte-Haddon Hall.

Friday Morning—September 23

9:00 A.M.—Technical Papers.
10:40 A.M.—Business Meeting.

ABSTRACTS OF PAPERS

Wednesday Afternoon—September 21

2:10 P. M.—Some Problems Involved in the Grading and Testing of Natural Rubber. ***W. P. Fletcher (British Rubber Producers' Research Association, Welwyn Garden City, England).***

The work of the B.R.P.R.A. on this subject falls into two main sections, one being concerned with the properties of the raw material as such, e.g. plasticity, and the other being concerned with the properties of compounds and vulcanizates which may be prepared from it. The paper deals mainly with the latter section.

It was necessary to make an early decision upon a suitable test compound, upon the properties to be investigated, and upon the test methods to be employed. Various gum stocks, including the A.C.S. test formula, were used in the early work since such stocks were considered to be suitable for demonstrating clearly any important variation in the raw rubber. An important factor governing the ultimate choice of a test compound was the sensitivity of some compounds to moisture content.

As regards properties to be investigated, abrasion resistance and flex cracking were ruled out of the early work because of the inherent difficulties of such tests. The high experimental error associated with tensile strength tests and the small number of applications in which tensile strength is known to be a critical factor suggested that this measurement should not be given undue importance in the program of work. Most of the measurements were of tensile strain at a fixed time after application of a definite load, using a very simple apparatus of the same general type as that developed by the U.S. Bureau of Standards. This type of measurement has been shown to be subject to a lower experimental error than the conventional "modulus" test. A feature of the method used is the absence of any necessity for measuring or marking of test pieces or for any calculation to give the final result. In order to obtain maximum discrimination between rubbers, mixing and curing errors were investigated and reduced by the employment of improved techniques.

Data are given on rubbers from a number of Malayan estates, variation between and within estates being estimated.

2:40 P. M.—Determination of the Refractive Indices and Second Order Transition Temperatures of Elastomers at Temperatures from 25° C. to —120° C. ***Gerhard M. Brauer and Richard H. Wiley (University of North Carolina, Chapel Hill, North Carolina).***

In previous papers [*J. Polymer Science*, Vol 2, p. 10 (1947); Vol. 3, pp. 455, 647, 704 (1948)] a refractometric method was described for determining the second order transition temperatures (T_m) of polymers whose transitions occur between 75°C. and —60°C. The convenience with which the measurements can be made suggested further study to establish the utility of the method for the determination of T_m below —60°C. This paper reports (1) development of the experimental technique for the determination of refractive indices at temperatures down to —120°C. and (2) refractive index data obtained by this method for natural rubber and a number of synthetic rubbers. This development makes possible a rapid and accurate method for determination of T_m of rubberlike polymers.

Measurement of the refractive indices at temperatures below —60°C. is best accomplished by insulation of the standard Abbe refractometer. Dry air used for the cooling medium is passed through liquid air into the insulated refractometer. By careful adjustment of the air flow, temperature control of ± 0.5°C. from 30° to —120°C. is obtained. Substantially lower temperatures can be obtained by passing air through a cooling coil immersed in liquid air instead of through the liquid air container, but this method has the disadvantage of poor temperature control and excessive consumption of liquid air. Refractive index readings can be made by either the transmitted light technique or the method of grazing incidence. Both methods give values for n_D and T_m which agree within ± 0.0002 in n_D and of ± 2°C. in T_m.

Refractive index vs. temperature data show the usual change of slope which locates T_m. The observed values for T_m agree with the values obtained by other methods where data are available for comparison. A series of fractionated polyisobutylenes show little change in T_m in the range of 233,000 to 4,300 molecular weight. Removal of impurities from commercial GR-S does not produce any significant change in T_m.

3:00 P. M.—Application of Microradiography to Rubber Compounding Problems. *M. J. Brock (Firestone Tire & Rubber Co., Akron, Ohio).*

The use of radiography for the purpose of determining macro inhomogeneties within materials is well known and has been used since the discovery of the penetrating power of x-rays. Less well known, however, is the use of combined radiography and microscopy under special conditions to determine in detail the micro or semi-micro structure within opaque materials.

A simple microradiographic camera is described for studying rubber specimens in both the relaxed and elongated state. This camera can be used with ordinary x-ray diffraction equipment serving as a supply for unfiltered, low voltage x-radiation. The x-ray beam for this study was produced by a Philips Norelco x-ray diffraction unit using a copper target x-ray tube operated at 15 kilovolts and 15 to 20 milliamperes. A target-sample distance of 4.5 inches was found to be adequate for producing a sharp radiographic image. The radiograph is recorded on extremely fine grain film. Eastman film having a type 548-0 spectrographic emulsion was used in this work. The radiograph of the sample is subsequently used as a microscope specimen and enlargements up to 300 diameters can be obtained. The degree of magnification is limited, of course, by the resolving power of the film used.

The specimens for radiography are prepared by pressing the elastomer out into sheets of the desired thickness between layers of cellophane. For studying vulcanized samples the compounded stock is cured in a circular mold .012 inches thick. Specimens thicker than .015 inches are undesirable.

In the study of pigment dispersion, the technique is useful in estimating the degree of dispersion of loading materials and compounding ingredients. The dispersion in masterbatches, and the efficiency of various pigment coating treatments designed to improve dispersability, can be studied.

The method has also been applied to the study of elastomer dispersions and the observation of vacua which are formed around various pigment particles when a vulcanized sample is elongated. From a study of such vacua it is possible to obtain information concerning the ease with which various pigment particles are wet by a particular elastomer.

A microradiographic study of flex cracking shows that cracks or surface ruptures may be caused by large particles or aggregates of small particles embedded near the specimen surface. Using a micro x-ray diffraction technique some of these particles have been identified as aggregated zinc oxide and carbon black "grit" particles.

A comparison of the microradiographic technique with microscopic methods shows that microradiography is superior for the study of opaque rubber compounds and it is even valuable in obtaining information supplementary to microscopic data when semi-transparent specimens are being studied.

3:25 P. M.—The Ultra Speed Tensile of Rubber and Synthetic Elastomers. *D. S. Villars (U. S. Rubber Co., Passaic, N. J.).*

A high speed stress-strain machine has been developed which is capable of recording the stress-strain curve of elastomers at elongation rates up to 270%/msec. Data are reported on two series of gum and tread stocks of Hevea and of the synthetic elastomers, GR-S, Hycar OR, Butyl, Perbunan and Neoprene GN. The second (elastomer) series was also run at 150°C.

In general, stress-strain curves fall into two classes. Stocks of elastomers which are known to crystallize on stretching tend to show tensiles which decrease with increasing speed up to about 10%/msec., pass through a minimum and rise more or less drastically to values 100% (or more) greater than the Scott tensile. Elastomers which do not crystallize on stretching tend to show a steady rise in tensile with increasing speed. Elongation at break curves show a maximum with crystallizing stocks and no maximum with non-crystallizing stocks.

The shape of the modulus versus speed curves is accounted for on the hypothesis of different types of slipping bonds with different characteristic relaxation times. The shift of curves for tread stocks with temperature allows the estimation of a heat of activation of slippage. This comes out to be of the order of 3 kg. cal.

3:50 P. M.—Effects of Sulfur and Accelerator Variations Upon the Physical Properties of a "Cold Rubber" Tread Stock. *L. R. Sperberg (Phillips Chemical Co., Bartlesville, Okla.).*

The effect of sulfur and accelerator variations over a wide curative range has been investigated in two "cold rubber" (Philprene A) tread stocks reinforced with Philblack A and with channel black. The sulfur variations ranged from 0.5 to 3.0 PHR while the accelerator (benzothiazyl sulfenamide) was varied from 0.75 to 3.0 PHR. The selection of sulfur and accelerator levels has been purposely broadened so as to cover a wide range of cure states ranging from extreme undercure to extreme overcure. Very complete physical properties have been developed, both on the original stocks and on stocks oven aged 24 hours at 212°C.

The data have been plotted in such a manner that the specific effects of changes in accelerator and sulfur levels upon the various physical properties may be determined instantly from a series of specially prepared graphs. A few three dimensional graphs plotting accelerator versus sulfur versus cure time have been prepared for some of the more pertinent properties.

A study of the isopleth (a graph showing the occurrence of any phenomenon as a function of two variables) graphs shows very strikingly the tremendous effect of accelerator dosage upon ultimate physical properties of compounds. With "cold rubber" one part of accelerator is almost equivalent to one part of sulfur in its effect upon modulus, tensile, resistance, flex life, and hardness. Mooney scorch data determined at 280° and 307°F. show that accelerator dosage has a negligible effect but that the sulfur level has a direct effect upon the ultimate scorch time.

State of cure data, using the relaxed compression set test as the criterion for measuring this property, show rate of cure to increase with increase in the sulfur and accelerator levels up to 2 PHR of sulfur beyond which point sulfur activates very little.

Tensile strength is at a maximum at from 1.9 to 2.4 PHR sulfur and 1.35 to 2.0 PHR of accelerator. The sulfur level is more critical than the accelerator level, particularly after oven aging.

One of the trends observed in this study was unexpected and contrary to the generally accepted ideas of rubber compounding. Laboratory abrasion data (original and aged, unextracted and ETA extracted) showed the abrasion resistance to undergo no degradation and in several cases to actually improve slightly as sulfur and accelerator levels were lowered (while still maintaining essentially equal state of cure) although all the other properties showed evidence of so-called "accelerator starvation." This trend is wholly contrary to generally accepted ideas of the effect of sulfur and accelerator dosage upon abrasion resistance. In order to determine if this effect was real, experimental tires were built (9.00-20) wherein the accelerator was lowered from 1.2 to 0.9 PHR in a Philblack O reinforced compound containing 1.75 PHR of sulfur. At 50 per cent of the nonskid tread loss, on tires which will give approximately 55,000 miles of drive wheel wear before wearing smooth, the compound containing the lower accelerator quantity is not only equivalent to but is actually showing a small superiority approaching 10 per cent improvement to the higher accelerator control tread. The crack growth resistance of the tires has not been impaired by the reduction in accelerator content.

Similar laboratory trends were observed in natural rubber-Philblack A and channel black systems although the extent of variance was somewhat less. Road wear results on natural rubber Philblack O tires are confirming the laboratory abrasion data in that a lowering of either sulfur and/or accelerator dosage without reducing the state of cure has resulted in no degradation in the wearing qualities of the treads.

4:20 P. M.—Improvement of Dispersion of Benzothiazyl Disulfide in GR-S and Natural Rubber by the Use of Fusion Mixtures with Sulfur. *M. C. Throdahl (Monsanto Chemical Co., Nitro, W. Va.).*

A series of low-melting fusion mixtures specific for benzothiazyl disulfide and sulfur have been found to improve the dispersion of this accelerator in GR-S and Hevea rubber stocks. Both high-melting, slightly soluble accelerator and sulfur are

thus incorporated into the rubber stock in the liquid state. Preparation of fusion mixtures and methods of measuring dispersion are described. Data are shown which demonstrates the dispersing, vulcanizing and aging properties of one of the low-melting fusion mixtures. On an equivalent weight basis with separate components the fusion products are faster in rate of cure, slightly more scorchy, and equal in aging properties. These effects are more pronounced in GR-S than in Hevea rubber.

Thursday Afternoon—September 22

2:00 P. M.—Mooney Scorch by Varying Temperatures. ***A. A. Somerville and G. C. Maassen (R. T. Vanderbilt Co., New York, N. Y.)***

No abstract available.

2:15 P. M.—The Importance of Controlling Heat Losses in Molding Operations. ***R. E. Shrader and W. N. Keen (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).***

The time required for a mold to reach the temperature of the press following the cooling which takes place during the normal loading and unloading cycle is far greater than is usually suspected. This factor has become of increasing importance with the development of the extremely short curing cycles at high vulcanizing temperatures commonly followed in some branches of the rubber industry.

Tests were conducted on a laboratory press, and data are presented to show that the magnitude of the temperature drop varies as the temperature of the press increases from 125°C. (259°F.) to 162°C. (324°F.) and that the time for the mold to reach the platen temperature after reloading is approximately 9 minutes.

These effects can be minimized by insulating the hot mold from the apron or bench during the loading or unloading cycle. Tests were carried out using various insulating materials, and it was shown that the most practical method consists of placing the hot mold on stainless steel rods, thus providing an air gap between the mold and the apron or bench.

The practical importance of this technique is demonstrated by comparative data on both a natural rubber and a neoprene vulcanizate of the type commonly used for mechanical goods.

2:35 P. M.—Polyamine-Activated Polymerization. ***G. S. Whitby and N. Wellman (University of Akron, Akron, Ohio).***

The authors have found that many amines have the ability to decompose peroxides and hydroperoxides, and that some amines, especially the polyalkylene polyamines, when added to an emulsion polymerization system in which the "catalyst" is an organic hydroperoxide increase the vigor of polymerization so greatly as to make it feasible to bring about polymerization at low temperatures in relatively short periods of time. Thus, for example, in a soap emulsion, styrene underwent 70% polymerization in 1 hour at 10°C. under the influence of 0.2% cumene hydroperoxide and 0.2% tetraethylenepentamine; a 70-30 butadiene-styrene mixture emulsified in a soap solution gave a 70% yield of polymer in 6 hours at 10°C. with the same catalyst combination, and a 58% yield in 6 hours at 10°C. under the influence of 0.2% cumene hydroperoxide and 0.2% triethylenetetramine. Using diisopropylbenzene hydroperoxide in place of cumene hydroperoxide, reaction rates were still higher.

Diethylenetriamine is considerably less effective than the two polyamines just mentioned, and ethylenediamine is almost entirely lacking in activating effect. It appears that the presence in the amine molecule of both primary and secondary (or tertiary) amino groups is necessary for the activating effect. Thus, for example, N-monoalkylethylenediamines show activity whereas sym.-di-N-alkylethylenediamines do not. The tri-primary mono-tertiary amine, tri (beta-ethylamino) amine, will function as an activator. 1, 3-Bis (2'-aminoethylamine) propane has an activating effect but is not as powerful as triethylenetetramine, from which it differs in having a trimethylene grouping in the chain in place of one of the ethylene groups.

In addition to the free polyalkylenepolyamines, their condensation products with acetaldehyde and other aliphatic aldehydes and the maleamic acids formed by their addition to maleic anhydride will function as activators.

3:20 P. M.—Alfin Catalysts for Polymerizing Butadiene. ***A. A. Morton (Massachusetts Institute of Technology, Cambridge, Mass.).***

No abstract available.

4:05 P.M.—The Biosynthesis of Isoprenoid Structures. ***John R. Johnson and Koert Gerzon (Cornell University, Ithaca, N. Y.).***

This paper is an interim report of a study of the biosynthesis of rubber which is being carried on at Cornell University under the sponsorship of the Office of Rubber Reserve, Reconstruction Finance Corporation.

Our general objective is to determine the particular organic substances that serve as immediate precursors of the isoprene units that are converted by various plants into polymeric isoprenoid structures (terpenes, diterpenes, triterpenes, etc.). This information may then furnish a basis for investigation of the intimate mechanism of the natural polymerization process.

It is most probable that simple molecules of carbohydrate origin, such as acetic and pyruvic acids, are the starting materials for natural syntheses of isoprenoid structures. Pyruvic acid, which is the keystone of the whole scheme of biosynthesis, furnishes by enzymatic transformations a variety of reactive intermediates. Without excluding other hypotheses, the present work has been based broadly on the view that pyruvic acid and acetone (or related structures) undergo condensation to furnish a C_6 hydroxy acid, "acetone-pyruvic acid," which leads to an unsaturated C_5 alcohol or a saturated C_5 glycol that plays a significant role in isoprenoid syntheses.

The general plan has been to prepare samples of a variety of C_5 unsaturated alcohols and related glycols, C_6 hydroxy and amino acids, etc., and to study the effect of these compounds on growing tissues of two rubber bearing plants, Crypostegia and Russian dandelion.

Of about twenty compounds that have been tested, many exhibited toxic effects at concentrations of 500 parts per million or less. Two of the C_5 alcohols, 2-methyl-3-butene-2-ol ("isoprene alcohol") and the glycol, 2-methylbutane-1,3-diol, were relatively non-toxic and appeared to be capable of serving as sources of carbon for plant growth and for latex production. A summary of the plant growth tests and of hypotheses based on these results will be presented.

Friday Morning—September 23

9:00 A. M.—New Developments in Silastic. ***A. D. Chipman, H. F. Schmidt and G. M. Konkle (Dow Corning Corp., Midland, Mich.).***

Silicone rubber has been reported to possess certain desirable properties which are inherent in its chemical structure. The most important of these are: (1) Stability at high temperatures; (2) Weather resistance; (3) Low temperature flexibility, and (4) Resistance to lubricating oils. Silastic, the Dow Corning silicone rubber, was initially formulated into a series of stocks and pastes all of which possess the essential properties listed.

Since the introduction of the original Silastic stocks, a number of new compounds have been developed which retain the desirable characteristics of the earlier formulations and possess some greatly improved properties. These are: (1) Increased tensile strength and elongation; (2) Ability to withstand lower temperatures; (3) Greatly reduced compression set, and (4) The property of being self extinguishing when kindling flame is removed. In general, only one of these improvements have been incorporated in a single formulation. There are some new stocks, however, that possess two or more of these desirable properties.

Low Temperature Silastics: Silastic in its early stages of development had brittle points of —70°F. to —90°F. but it could not be used successfully for very long periods of time at temperatures below —65°F. To supply the military demand for a material flexible indefinitely at —70°F., a new

series of Silastic stocks was developed. These materials have brittle points in the range of —130°F. and easily withstand continuous exposure at —70°F. In addition, they retain the high temperature stability characteristic of the silicone rubbers and show a somewhat lower compression set. Their other physical properties are comparable to those of the original Silastics.

Compression Set: Silicone rubbers have always possessed good resistance to compression set at elevated temperatures. The per cent set after 22 hours at 300°F. under 25% compression is approximately 40% for the best of the original Silastic stocks. The industrial demand for resilient materials with high resistance to permanent deformation at 300°F. and upward, was met by a series of Silastics which, under similar conditions, have a compression set of 10 to 25%. The per cent set at 390°F. and 480°F. was also reduced.

Flame Resistance: All silicone rubbers possess a certain degree of flame resistance. Under most conditions, however, they will not only burn, but will support combustion. A group of Silastic stocks have recently been developed which are self extinguishing even under drastic conditions. This material supplied the need for a rubber for use at high temperatures which will not support combustion if subjected to flame or extremely high temperatures.

Silastic 250: One of the major deficiencies of silicone rubbers has been their relatively low combination of tensile strength and elongation. Recently the first major improvement in both of these properties has been accomplished in Silastic 250. Although some Silastic stocks have elongation values almost equivalent to that of Silastic 250 and others have an equivalent tensile strength, none has a comparable combination of elongation and tensile strength. The efficiency of Silastic 250, expressed as the product of tensile strength times elongation, is 2 to 6 times that of any previous Silastic. Tear resistance and abrasion resistance are correspondingly improved.

In addition to increased tensile strength and elongation, Silastic 250 has a brittle point in the range of —130°F. and is as serviceable at low temperatures as the series of stocks specially compounded for this purpose. It also has a high degree of heat resistance. Electrical properties are improved and they are exceptionally stable over a wide temperature range.

9:20 A. M.—Properties and Utilization of Polyacrylic Rubbers. *H. P. Owen (B. F. Goodrich Chemical Co., Cleveland, Ohio).*

The four polyacrylic rubbers referred to in this paper are commercially available from the B. F. Goodrich Chemical Company and are identified as Hycar PA, PA-11, PA-21 and PA-31. Hycar PA is an elastomeric polymer of an acrylic acid ester. Hycar PA-21 is a copolymer of an acrylic acid ester and a halogen-containing derivative. This copolymer (experimentally identified as Lactoprene EV) was developed by the Eastern Regional Research Laboratories, U. S. Department of Agriculture. Hycar PA-11 and Hycar PA-31 are special forms of PA and PA-21 which are designed for easier processing. They are not recommended for cements and their vulcanizates are somewhat less resilient.

These chemically saturated, thermoplastic polymeric materials are responsive to certain vulcanization processes which convert them from thermoplastics to thermosets or "cured" products with a possible hardness range comparable to conventional rubbers. Properties of the vulcanizates of these elastomers are described with particular reference to their usefulness in high temperature (300° to 400°F.) service applications.

The properties discussed include the ability of these elastomers to withstand the deteriorating effects of sustained high temperatures in air and various non-aqueous immersion media; resistance to flexural breakdown, compression set, ultra-violet light, ozone, and gas-diffusion; compatibility with plasticizers and other type rubbers; and electrical properties of specially compounded stocks.

Variations in compounding, mixing, processing and curative systems, necessary to attain optimum properties for the individual polyacrylic rubbers, are also discussed briefly with specific usefulness of each type emphasized. Furthermore, it is pointed out that polyacrylic rubbers may be processed with equipment which is standard to the rubber industry.

This paper suggests a number of commercial applications for polyacrylic rubbers, based on their inertness to the factors which normally cause accelerated aging and deterioration of the chemically unsaturated, conventional rubbers.

9:40 A. M.—The Vulcanization of Neoprene Type W. *D. B. Forman, L. R. Mayo and R. R. Radcliffe (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).*

Neoprene Type W is an improved chloroprene polymer which has a much more uniform molecular weight distribution than any of the other neoprenes. Neoprene Type W contains no sulfur, thiuram disulfide or other compounds capable of decomposing to give either free sulfur or a vulcanization accelerator. The fundamental differences between it and the other general-purpose neoprenes can be shown in a variety of ways; for example, its superior storage stability, improved processing characteristics and favorable response to a variety of vulcanizing systems.

The work presented in this paper shows that both with respect to the curing system used and the physical properties of the resulting vulcanizate, Neoprene Type W is more like natural rubber than any of the other neoprenes. Two general methods of acceleration, (1) metallic oxide-sulfur-rubber type organic accelerators, and (2) metallic oxide-neoprene type accelerators, are discussed. The variety of these combinations permits a degree of flexibility not previously available in neoprene compounding, particularly since the data show that some form of organic acceleration is necessary in order to obtain satisfactory rates and states of cure.

Comparisons are made between Neoprene Type W vulcanizates and those of Neoprene Type GN. The outstanding improvement in compression set values as well as other specific physical properties obtainable with Neoprene Type W are discussed.

10:00 A. M.—Stopping Agents for "Cold Rubber". *L. B. Wakefield and R. L. Bebb (Firestone Tire & Rubber Co., Akron, Ohio).*

In the emulsion polymerization process leading to the preparation of synthetic rubber, it has been found that the physical quality of the product reaches a maximum in a certain range short of complete conversion of monomer to polymer. For the practical isolation of the polymer at any given conversion, therefore, it has been found necessary to add a polymerization inhibitor, or shortstopping agent, to the latex at the optimum point. This agent must prevent increases in conversion during monomer recovery operations and latex storage up to the time of coagulation and drying. Since all normal emulsion systems involve the use of an oxidizing agent as the polymerization initiator, the stopping agent must decompose the remaining initiator as well as react with and destroy the polymer free radicals still existing, if further polymerization or cross-linking are to be avoided.

The early methods for evaluating stopping agents involved one of two tests. First, the experimental material could be added with the original charge and any tendency toward inhibition could be observed. Secondly, the potential stopping agent could be added at the desired conversion and an increase in conversion checked after aging the latex at an elevated temperature. The former test was discarded because certain materials could inhibit the initiation of polymerization without stopping an actively polymerizing system; the latter test was objectionable since cases were noted where Mooney plasticity increased even though the conversion remained constant.

A more thorough and searching method of evaluating stopping agents for synthetic rubber polymerization has been developed and used to demonstrate the value of several new compounds in stopping Redox systems. The technique involves heating the latex in the presence of the particular chemical being tested, with subsequent isolation and analysis of the polymer. The determination of the change in the polymer solubility, intrinsic viscosity and plasticity in addition to the presently accepted conversion test made possible the development of materials showing a high degree of stopping activity. The determination of the aged cut growth resistance of compounded and cured stocks has also been used to evaluate those

stopping agents which the earlier tests had shown to be of value.

Since early work had shown that 2, 4-dinitrochlorobenzene was a powerful stopping agent but was undesirably toxic, much of the work reported herein was concerned with the preparation and testing of reaction products of this material which are expected to be equally effective, but less toxic. Of these derivatives, dinitrophenyl benzothiazyl sulfide, dinitrophenyl pyridinium chloride and dinitrobenzenethiol were found to be the most effective. All but the last material were tested on a pilot plant scale, and it was shown that by the use of the first-named compound, polymers with a significantly superior aged cut growth resistance could be prepared. Toxicity tests on the pilot plant samples are now in progress.

The results obtained from a study of other derivatives indicated that the presence of nitro groups was not alone sufficient to give stopping activity and also that oil-solubility was not essential. In some cases a heat softening of the polymer while in the latex state was observed. This was most noticeable with the combination of 2, 5-ditertiary butyl hydroquinone and sodium nitrite, by means of which a high initial gel was reduced to zero during the latex aging period of the test.

10:20 A. M.—Effect of Oxygen on Rate of Polymerization of GR-S in Various Low Temperature Emulsion Systems. *R. W. Hobson and J. D. D'Ianni (Goodyear Tire & Rubber Co., Akron, Ohio).*

The presence of oxygen in the GR-S polymerization system has been considered undesirable since it inhibits the polymerization, as shown by Kolthoff and others. It has therefore become standard practice to reduce the oxygen content to as low a level as practicable. Recent work with Redox polymerization systems, such as the iron-cumenehydroperoxide recipe at 41°F., indicated they might be even more sensitive to the presence of oxygen than is the GR-S system, in view of the poor reproducibility of polymerization rate.

Accordingly, a systematic study was made of four different polymerization systems at 41°F. which were compared with the regular GR-S system at 110°F., to which various amounts of oxygen were added by hypodermic syringe just before polymerization was started. The low temperature systems were (1) a potash fatty acid soap recipe with sugar-ferrous sulfate-cumenehydroperoxide activation, (2) a potassium rosin acid soap recipe with similar activation, (3) a polyamine-cumenehydroperoxide activated recipe, and (4) a dodecyl mercaptan-potassium ferricyanide activated recipe.

Bottle polymerizations were carried out with the above recipes to study the effect of addition of various amounts of oxygen (0 to 10 ml. oxygen per 20 g. monomers) on the percentage conversion at 2, 4, 6 and 16 hours. Tentative conclusions based on these data are:

1. Of the five polymerization systems investigated, only two (those containing ferrous sulfate in the activator) are markedly sensitive to the addition of oxygen in small amounts (0.5 to 1.0 ml. per 20 g. monomers).
2. The type of polymerization system, rather than the polymerization temperature, seems to determine the sensitivity to oxygen. The ferricyanide recipe at 41°F. is relatively insensitive to oxygen when compared to the two ferrous sulfate-containing 41°F. recipes.
3. No evidence was obtained to indicate that a small amount of oxygen is necessary for optimum polymerization rate.

Since oxygen was shown to have a major effect on the polymerization activity of the ferrous sulfate Redox systems (undoubtedly due to oxidation to the ferric state) 5-gallon reactor polymerizations were carried out in which a chemical "scavenger" sodium dithionite ($Na_2S_2O_4$) was added to destroy oxygen in the soap solution and monomers prior to the addition of the activator system. Improved rates of polymerization were obtained by the addition of .05 part, whereas smaller amounts had little effect and larger amounts caused the polymerization to die off at lower conversions. The interpretation of these data is difficult since the exact oxygen content in these larger scale reactors was not known, and since it was shown in subsequent bottle runs that sodium dithionite and cumenehydroperoxide were capable of forming a Redox pair in the absence of the iron activator.

It is concluded that since small amounts of oxygen apparently have a greater effect on the polymerization in ferrous sulfate-containing Redox formulations now used for the production of "cold rubber" than on the polymerization of GR-S in the mutual recipe, great care should be exercised to eliminate oxygen from the system at all times.

11:00 A. M.—Low Temperature Stiffening of Elastomers. *S. D. Gehman, P. J. Jones, C. S. Wilkinson, Jr., and D. E. Woodford (Goodyear Tire & Rubber Co., Akron, Ohio).*

The ordinary stiffening of elastomers at low temperatures may be supplemented by the occurrence of crystallization if the elastomer has sufficient regularity of molecular structure and other conditions are favorable. To study these effects, observations of the progressive stiffening of elastomer compounds at low temperatures were made by measurements of the relative torsional modulus of test strips mounted in racks which were stored between measurements in a low temperature box. The period of observation was usually thirty days but in some cases was extended to two months. Temperatures were in the range from about —60°C. to —20°C.

In the case of Hevea, variables studied included plasticizer content, cure, carbon black loading, blending with GR-S, and compressive strain. The effect of compressive strain on the progressive crystallization of Hevea compounds was judged by the extent of the recovery when the compression was released. Results are included for Butyl rubber, Redox polybutadiene, and 85-15 butadiene-styrene Redox copolymer compounds.

The degree of vulcanization as determined by the combined sulfur exerts a controlling influence on spontaneous stiffening, especially for Hevea. As the cure is increased, longer periods of induction occur before crystallization becomes evident and the subsequent rate of increase in stiffness is reduced. A combined sulfur value greater than 2.5% (based on the rubber) appears to be sufficient, judged from these tests, to practically forestall the spontaneous crystallization of Hevea. The lattice fixed points introduced by vulcanization evidently interfere seriously with the molecular rearrangements required for spontaneous crystallization. Compressive stress, on the other hand, sets up crystal nuclei from which crystallization may readily proceed so that the process is accelerated. Carbon black loading definitely enhanced the short term stiffening of Hevea but had a relatively small effect in increasing the long term stiffening of the unstressed samples. For the stressed samples at the same compressive strain, the stress was greater with increased black loading and crystallization was promoted. The admixture of GR-S with Hevea did not delay the onset of crystallization but tended to prevent the stiffening from proceeding as far as it otherwise would. The crystallization of Hevea in such blends will depend, undoubtedly, on its rate of cure in the blend. Long term stiffening effects with plasticizers are complicated similarly by effects on cure and, in addition, by the possibility of low temperature incompatibility.

A broad optimum temperature range, about —20°C. to —40°C., was observed for the stiffening of the Hevea compounds. Progressive stiffening at low temperatures was observed also for Butyl rubber compounds and the Redox polybutadiene and 85/15 butadiene-styrene copolymer.

Although the phenomena of spontaneous stiffening of elastomers at low temperatures are complicated by many factors, a useful degree of generality appears in some of the results.

11:20 A. M.—The Effect of Compounding Ingredients on the Weather Resistance of Neoprene Vulcanizates. *D. C. Thompson and N. L. Catton (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).*

The superiority of neoprene vulcanizates in services involving outdoor exposure has been well established. Work presented in this paper shows that compounding ingredients exert a more pronounced effect on the weather resistance of neoprene vulcanizates than has been recognized previously. This is especially true of non-black stocks.

Exposure tests have been conducted in Florida, Delaware, and in the Weatherometer. In general, it is shown that the amount of loading is of secondary importance to the type of loading. Data are presented which show that the weather re-

sistance of neoprene vulcanizates is increased by certain loading materials, for example, clays, whereas it is decreased by other materials, such as whiting. When materials which adversely affect weather resistance are used, the amount of such loading becomes an important factor.

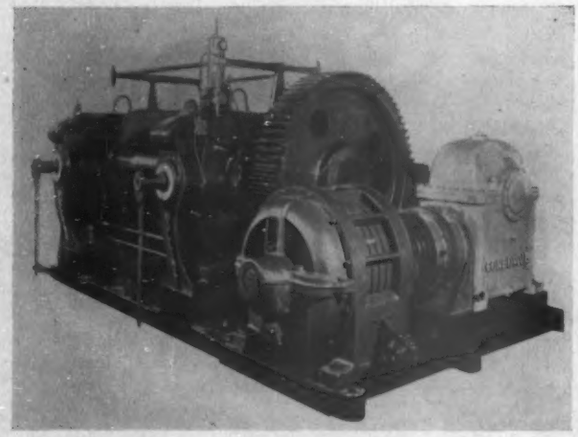
The effect of substituting varying amounts of GR-S or rubber for the neoprene in a clay loaded vulcanizate containing 60% elastomer by volume was studied, and it is shown that increasing the concentration of the less weather-resistant elastomer has a deleterious effect, although the decrease may not always be linear.

11:40 A. M.—Mechanism of Reinforcement. IV. Adsorption of GR-S by Carbon Black. ***Leonard E. Amborski and Carl E. Black, III (E. I. du Pont de Nemours & Co., Inc., Buffalo, N. Y.) and George Goldfinger (University of Buffalo, Buffalo, N. Y.).***

Infrared absorption analysis has been carried out to determine whether the adsorption of GR-S (copolymer of polystyrene and polybutadiene) on carbon black is specific as to the chemical structure of the polymer. The comparison of the relative intensities of the characteristic absorption bands of the original GR-S with the ratios of the intensities of the same bands for the fraction of rubber remaining after certain fractions were specifically removed by carbon black has shown that the adsorption is not specific as to chemical structure within the limits of accuracy of infrared analysis. The particular chemical groups considered were the phenyl structure (infrared absorption at 13.20 and 14.27 microns) of polystyrene and the 1, 2 (10.08 and 10.95 microns) and 1, 4 (10.37 microns) addition units of butadiene.

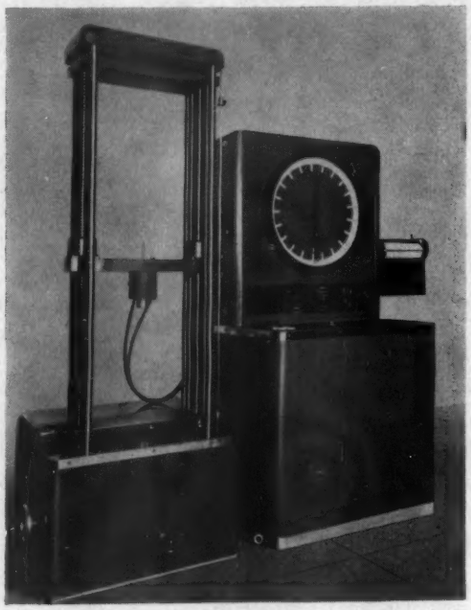
Stewart Bolling Pacemaker Mill

An improved drive on its 60-inch Pacemaker heavy-duty rubber mill has been announced by Stewart Bolling & Co., 3190 E. 65th St., Cleveland 4, Ohio. The drive is credited with quieter operation, increased ruggedness and reduced floor space required. Through the use of compact Cone-Drive standard speed reducers, it has been possible to mount the entire mill with its drive on a single cast iron base at floor level. A similar drive and single base assembly is also available for the company's 50-inch mill. Double enveloping characteristics of the Cone Drive gearing with more contact per tooth and more teeth in contact is credited for the increased stability of the drive to handle with ease the severe shock loads which occur particularly when the hard crude rubber is thrown into the rolls at the start of the mixing process.



Baldwin Low-Range Testing Machine

A new universal testing machine for plastics, textile materials, fibers, cords, and other materials, with a capacity of 5,000 pounds, has been announced by the Baldwin Locomotive Works, Philadelphia 42, Penna. Hydraulic and pneumatic load cells are used as load-sensitive elements in the weighing system, both operating a Tate-Emery indicator. Four standard load ranges are provided by the hydraulic cell. These are 5000 lbs., 1000 lb., 200 lb. and 50 lb. Two additional ranges of 10 lb. and 2 lb. are provided when specified, by means of an air cell.



Front view of low-range tester

The indicator is contained in a separate cabinet, as with all larger Baldwin testing machines, thus giving flexibility in the relative positioning of the two units. Features of a new design of cabinet are heavy gage sheet steel, ample space for special accessories for control and indication, accessibility to mechanism through easily removable rear panels, and indirectly lighted indicator dial. All loads are indicated on a 24-in. masked dial with a 66-in. scale. Load ranges are shifted instantly by solenoid-operated air valves that are controlled by means of a knob located on the indicator control panel board.

Tension and compression loads are applied by a straining cross-head which is motor-driven by two vertical screws giving a 48-in. stroke. Loading speeds are held constant by electronic controls in a 400:1 range of 0.05 to 20 in. per minute. Accuracy of the load indications is within 0.5 percent of reading, or one scale division, for the upper three ranges and within 0.75 percent of reading, or 1.5 scale divisions for the lower three ranges.

A recorder may be used with the machine and will plot stress-strain curves with 10-in. ordinate for one-half and full capacity of any range. For example, a stress-strain curve can be obtained having a full 10-in. scale equivalent to 1.0 lb. The machine is designed for automatic reversal and cycling of loads and may be used with recorder to plot hysteresis curves automatically.

When set up as illustrated, the machine and indicator occupy a floor area of approximately 75 x 28 in. Overall height is 83 inches.

The Role of Blast Cleaning Apparatus in Bonding Rubber to Metal

By J. F. FARRELL

THE bonding of rubber to metal by means of cementing or vulcanizing has been receiving greatly increased attention in recent years and has shown excellent results in many new applications. It provides a continuous bond that distributes stresses evenly over the entire bonding surface and eliminates the stress raisers that are always present when mechanical fastening devices are used. We are still only on the threshold of a working knowledge of the factors that go to make up a first class bond, but the advantages the process offers are great enough to justify widespread research and interest in this fascinating problem.

It is generally recognized by now that one of the most important steps in insuring a good bond is the preparation of the surfaces prior to the bonding operation. Although there is still much we do not know regarding the best types of surfaces for bonding rubber to metal, past experience has indicated certain very definite requirements. All oil, grease, or other foreign organic materials should be first removed by means of solvent or caustic cleaning or else by burning. Hard encrusted materials such as scale, rust, paint, etc., should also be removed either by pickling, abrasive blasting or some similar method.

Blast Cleaning Equipment

Long a familiar sight in foundries and forge shops where it has enjoyed widespread use in the removal of burned-in sand and scale, blast cleaning has lately found many other applications. These have included the removal of virtually every type of dry, hard surface contamination and the preparation of surfaces for a wide variety of finishes. One of the most common of these applications has been its use prior to rubber bonding.

Blast cleaning equipment may be broken down into two main classifications, according to the method used in propelling the abrasive, as either air blast or airless blast.

In air blast equipment, the abrasive is forced through a nozzle by means of compressed air and the abrasive stream is in the shape of a narrow cone. This is the older of the two methods and is considerably slower and more expensive in operation. It also has another disadvantage when used as a preparation for bonding—the difficulty of removing all moisture from the compressed air. If moisture is present there is the obvious danger that the surface will start to rust immediately after blasting.

Because of the finely directed abrasive stream, air blast has the advantage of being able to clean deep, narrow openings and cavities such as the interior of pipe. Where an adequate supply of compressed air is already available, the initial investment is also lower and, if relatively few parts are to be processed, this is an important advantage.

Airless blasting, on the other hand, is used in relatively high production requirements; it provides a more uniform surface and is more economical to operate. The abrasive is hurled by means of a bladed wheel and may reach a velocity in excess of 12,000 feet per minute. One such wheel will throw between 300 and 500 lbs. of abrasive per minute at a power cost of only one twelfth that of compressed air. The abrasive stream is fan shaped and provides complete and thorough coverage; the scouring action of the abrasive particles effectively removes every trace of foreign material.

The abrasive used in either type of equipment is usually chilled iron shot or grit, although sand and other non-metallic abrasives may be used when the occasion demands. The metallic abrasive has greater striking force (hence more cleaning power) and results in much less wear on the blast equipment.

The recent appearance of malleableized iron shot and grit, true steel shot and copper shot have greatly widened the choice of metallic abrasives and suggest the possibility of still greater decreases in equipment wear.

In some applications a situation may arise which requires additional corrective action. This is the creation of a film of dust which settles on the cleaned surface and may in some cases interfere with the bonding operation. Where such a dust film is objectionable, it may in

FIG. 1—A load of steel inserts about to be discharged from a batch type mill. These parts are used as inserts in molded rubber goods by the Guiberson Corp. at Dallas, Texas. (All photographs courtesy of American Wheelabrator & Equipment Corp.).

FIG. 2—A swinging table type machine manufactured by American Wheelabrator and used by the Murray Rubber Co. at Houston, Texas, for cleaning prior to bonding.

some cases be eliminated by changing abrasive or else it may be removed by a blast of air or by wiping the surface with a moistened rag.

Surface Roughness

The most desirable degree of surface roughness for bonding is far from being a cut and dried proposition and widely divergent opinions are frequently encountered. It seems likely, however, that these differences of opinion are due to a lack of agreement as to whether a given increase in bond strength is worth the cost of achieving it. This is an economic decision that must be decided anew for each specific case.

The roughness is controlled primarily by the size of the abrasive although a certain amount of control is also possible by varying the abrasive velocity. A coarser abrasive means faster cleaning and a rougher surface.

The effects of various types of surfaces on the relative strength of metal to rubber bonds is discussed by E. E. Blaurock in a comprehensive article appearing in the March, 1947, issue of *Machine Design*. Samples were tested in shear with the load applied parallel to the face of the metal and the following results were reported as percentages of the bonding strength of the grit-blasted surface which was used as the control:

Grit blasted	100%
Finely polished	147%
Hammered finish	97%
Small longitudinal corrugations	86%
Large longitudinal corrugations	70%
Small transverse corrugations	63%
Large transverse corrugations	59%

Mr. Blaurock points out that while specific bond values will vary with compound type and shape factors, these tests nevertheless serve to indicate the general effect of surface roughening or ribbing on bond strength.

A typical example of the differences in opinion that occur when the subject of surface preparation arises may be cited in the case of two rubber companies in Ohio that were rubberizing steel tractor tread inserts during the war.

One company used a very fine grit blast and then copper plated the part prior to bonding and found this practice to be entirely satisfactory. The other company, manufacturing an identical part, used as heavy a grit as possible without causing distortion in the work and then bonded directly after the blast cleaning operation. No washing, pickling or plating was used. Both companies have competent testing laboratories and both were confident that they were providing the best possible bond.

Work Handling Method

Once the method of blasting and the type of abrasive have been selected, the next important consideration is the choice of a work handling method best suited to the parts being cleaned. There are several standard designs of machines on the market today that have found application in the preparation of surfaces for bonding and these will be discussed individually with a brief description of their principle of operation, types of work handled and a few case histories, where available, to illustrate production rates. In connection with case history figures it must be emphasized that production rates and costs will vary from job to job and any figures given here cannot be applied to a new application without first running tests to determine their validity under the existing conditions.

The most popular type of machine is the batch type mill (Fig. 1) where the work is tumbled and cascaded under the blast of an overhead wheel unit. The work is carried on a continuous belt type conveyor shaped something like a "U" with one arm considerably shorter than the other. When the conveyor is run in one direction the work is tumbled in place and when the direction of the conveyor is reversed the mill unloads itself.

This type machine is normally used for cleaning small, compact pieces that are sufficiently rugged to withstand a gentle tumbling action. The size of the pieces handled will, of course, depend on the size of the machine.

A 5 cu. ft. machine used by Monarch Rubber Co., in Hartville, Ohio, for cleaning wheels, bolts and washers, operates 16 hours per day with a cleaning time of five to seven minutes per load. Some additional time is consumed in loading and unloading the machine.

Lovell Manufacturing Co., of Erie, Penna., uses a 5 cu. ft. machine to clean wringer rolls prior to rubber-

FIG. 3—A special cabinet for cleaning printer roller cores. The skewed dished rolls rotate the cores as they convey them through the abrasive blast.

izing. They have obtained better adherence with reduced maintenance costs and have eliminated the alkali washing, rinsing and pickling operations.

The Guiberson Corp., in Dallas, Texas, uses a 2½ cu. ft. machine to clean steel inserts in molded rubber goods. The size of the pieces range from a 2-inch diameter, cup shaped, 20 ga. sheet metal part to heavy steel castings of about 800 cu. in. Cleaning time averages six minutes per load.

Various table type machines are also available for handling parts which are too flat or too fragile to be tumbled successfully (Fig. 2). These machines are also used when work of widely varying sizes and shapes must be handled and production is not great enough to warrant the purchase of more than one blast cleaning machine.

Specially designed cabinets are also used for handling work which is not suitable for the standard tables or batch type mills. The work handling mechanism in these cases varies to suit the particular job but one of the most common is the skewed dished roll machine for cleaning long tubular work (Fig. 3).

In this type of equipment the long pipes or rods are conveyed through the blast zone by means of a series of rollers which have been dished out so that the work is supported at two separate spots. By varying the angle between these rollers and the direction of travel of the rod, a rotary motion is imparted to the work along with longitudinal travel.

A popular type of machine in the pipeline industry, this machine has found a ready acceptance in the cleaning of printer rolls prior to covering with rubber. Sam'l Bingham's Son Mfg. Co., in Chicago, uses this type machine to clean rolls which vary in size from ¼-inch dia. and 7 inches long to 16-inch dia. and 12 feet long. The weight ranges from a few pounds up to 750 pounds. Small rollers which required 20 minutes to clean by air blast are cleaned in 20 seconds in this machine. The larger rollers show considerably greater savings. Three stages in the manufacture of wringer rolls are shown in Fig. 4.

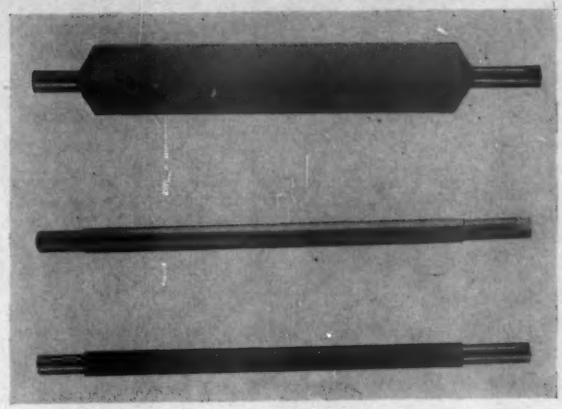


FIG. 4—Three stages in the manufacture of wringer rolls. Reading from bottom to top: the shaft as rolled and after machining, after grit blasting, and the finished product.

An interesting variation in the use of abrasive blasting was reported in the July, 1947, issue of RUBBER AGE. Brown Rubber Co., of Lafayette, Ind., blast cleans their molded sponge rubber strips to remove mica adhering to the surface.

The mica, which is used to prevent the rubber from sticking to the mold, interfered with subsequent bonding operations. In this case, it was found that grit blasting not only removed all the mica and provided a much superior bonding surface, but it also made the part numbers more legible and improved the strip's appearance.

The results of these and other installations have demonstrated that blast cleaning has found a permanent place in the surface preparation that is so necessary prior to any rubber-to-metal operation. However, the extent and importance of this application can only be guessed at this time and tests to improve the type of bond produced are continuing.

Additional Reports of Avoidable Accidents

SEVERAL additional reports of accidents in rubber manufacturing plants which could have been avoided by proper supervision or planning were contained in a recent issue of the Rubber Safety News Letter of the National Safety Council, as follows:

Flammable Solvent: An employee at a medical goods manufacturing plant carried a pail of rubber cement near a bench containing a burner. When he stopped to talk to another employee near the bench, the exhaust duct above the burner drew the vapor over the burner. When the vapor ignited, he dropped the pail and it turned over, spreading the fire. The fire was extinguished rather promptly with hand carbon dioxide units, but one sprinkler head was opened and a large amount of goods in process was damaged by water and by the interruption to production.

This accident would almost certainly have been prevented by the use of a proper safety-top container for the flammable material. It also does not seem like very good planning to have processes involving open flame in the immediate area of processes involving flammable liquids, especially flammable liquids used in the open.

Skid Troubles: Eight men were attempting to right a heavy skid which had been over-turned in the main aisle when it slipped away from them and fell back, pinning one man under it. He received injuries to both legs.

None of the men involved in this incident was a rigger and none had had any experience in the handling of this type of heavy equipment. They certainly required supervision or, better, instructions to leave jobs which they did not understand to those qualified to do them; in this instance, the riggers on the maintenance crew.

Horseplay: Two employees were engaging in some friendly horseplay in the locker room. One of them was still carrying a six-inch rubber knife in his hand. In the course of the fracas his hand, flying out at random, stuck the knife into the thigh of another man in the room who had no part in the disturbance.

This serious and painful injury was a result of horseplay which was directly contrary to instructions. To prevent a repetition of the incident, an immediate program was started to repeat the previous education on the danger of horseplay and both participants in the incident were given temporary suspension.

Some Aspects of Hose Manufacture and Design

By FRED W. BARLOW

HOSE manufacture is perhaps the broadest field in the rubber goods industry. It has extremely varied service conditions and customer demands. In size, hose ranges from ⅛-inch I.D. hydraulic brake to 10-inch and 12-inch I.D. oil suction and discharge hose. In fact, some dredge discharge and suction hose will have internal diameters of 24 inches, and even larger. Pressures that must be met vary from a few p.s.i. to 10,000 p.s.i., and even higher. The fluids carried run from lacquer solvents to superheated high pressure steam.

Such a variety of conditions imposed on the producer makes hose construction very diverse. For simplicity, only wrapped and braided hose of common use will be considered here, omitting such lines as fire hose, automotive and hand-made hose.

Market requirements slowly but certainly are demanding changed hose standards. In such large volume lines as garden hose, light weight is of more and more importance. It is also expected to be as flexible and colorful as possible. Rapidly becoming competitive in price, extruded plastic garden hose is now the first competitor to appear to regular garden hose.

In industrial lines ever increasing amounts of hose are now purchased to specifications, a worthwhile trend if the specifications are carefully drawn. There seems little necessity for such requirements as 3,000 p.s.i. tensile strength and 1000% elongation in the thin skim stock tube in vacuum cleaner hose, which came to the author's attention. The same specification carried no aging test requirement.

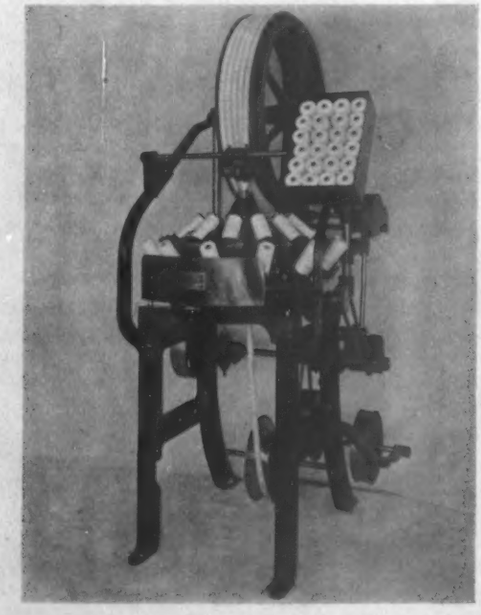


Fig. 1—24-Spool Wardwell Braider.

If customer demands on the hose designer and manufacturer have increased, the means open to him for their satisfaction has increased in even proportion at least, with the exception of high pressure steam hose.

The rubber manufacturer now has available a comparatively wide variety of elastomers for basic compounding: natural, reclaim, neoprene, Buna S, Buna N, and butyl. For water and air hose, tube stocks of natural rubber, Buna S, and reclaim, or mixtures of all three, serve well. The greater resistance of neoprene to oil and gasoline makes it invaluable for hose carrying these liquids. In this connection, it is interesting to note that neoprene can be vulcanized without any metallic compounds in the mix, an advantage in some chemical lines. The resistance of butyl rubber to acids makes it suitable for acid hose tubes but presents a problem of segregation in process. The butadiene-acrylonitrile synthetics provide good resistance to the aromatic hydrocarbons in aviation gasoline. In such severe service as lacquer spray hose, Thiokol FA, despite the extra care needed in processing, is outstanding.

Variety of Reinforcing Materials

There is an increasing variety of hose reinforcing materials. For decades, the standard textile reinforcing material has been cotton, either in yarn, sheetings, or ducks. By the patented Ustex process considerably higher tensile strength is now obtained in cotton yarn and with lower yarn diameters, low elongation and greater uniformity as well. In many cases, this permits a reduction from a 3-ply to a 2-ply braided hose with no loss in strength. Another development of interest is the fiber bonded process of Dan River Mills *(1)* which, in some applications, can eliminate the spinning operation in cotton yarn. Possibly the resins used for bonding the fibers might be selected on the basis of providing greater adhesion to the rubber parts of the hose.

The higher cost of cotton has stimulated the investigation of other textiles. Of these the most promising has been rayon, already well accepted by the tire industry. Although it is difficult to make an exact comparison, rayon is competitive to cotton yarn in price at the present time. Rayon has certain advantages. For instance, the high tenacity type has excellent strength for hose use; it is more uniform than cotton; and its price history has been more stable and, in general, consistently downward. On the other hand, its adhesion to rubber without special treatment is poor; it loses much of its strength when wet; and its slippery nature may require special tricks in braiding to prevent its slipping off the spools. Perhaps the answer lies in a yarn which is a blend of rayon and cotton, the rayon providing the strength, the cotton providing the adhesion to the rubber.

By the use of a latex-resorcinol-formaldehyde resin dip, the author has increased the adhesion 300 to 400% of rayon tire cord to a typical all-reclaim garden hose stock. Dry resin weight was about 35% of the yarn weight; in commercial practice this would probably be much lower. If rayon yarn processing by a method similar to this is impractical in the rubber plant, could it not be done in the rayon manufacturer's plant? At present most rayon yarn in rubber goods is filament rayon. A wider range of qualities is available if spun, or crimped rayon is used, especially so if the spinning is done on different systems such as the linen system, etc. Furthermore, these methods might permit the economic utilization of off-standard yarn.

One specific place where more durable fabrics are needed now is in the wrappers and jackets for poled hose. Open steam hose cures deteriorate cotton much too quickly. What fabric should be used in its place? Rayon loses strength when wet which is a requisite in the process. Nylon is set by steam. Maybe specially treated glass fabrics might do the job better.

Manufacturing Methods Little Changed

Fundamentally, methods of hose manufacture have changed little in several years. In making poled hose, better pole lubricants than the chalk-graphite-mica mixtures commonly used, are required. This mixture constantly presents a dust problem and its application is generally wasteful. Consideration should be given to the steel mandrels used. Would not magnesium or aluminum alloys be satisfactory and yet weigh appreciably less?

Braided hose seems to be more popular than wrapped hose. Braiders of the Wardwell type (Fig. 1) have considerably faster speeds than the usual type of hose braiders, although not available as yet in the larger sizes such as 48 and 64 spool machines. Few braiders approach the speed of the winding machines for reinforcement application. The latter apply two spiralled yarn layers simultaneously around the hose tube, one counterspiralled to the other. Speeds of about 45 ft. per minute for ½-inch and ⅝-inch I.D. garden hose are obtained. On the other hand, hose produced by this method is inferior in strength to braided hose, the interlacing of the yarn in the braided type giving a stronger construction.

For large volume lines of braided hose, the lead press method is standard, yet it suffers from certain obvious disadvantages. The melting of the lead and the stripping operation does create health hazards which must be guarded against. Large amounts of non-productive material have to be handled. For example, if a sheath thickness of .160-inch is used on ¾-inch I.D. hose with a hose O.D. of 1¼-inches, the amount of lead that has to be handled is over 2000 lbs. for a 600 ft. length—more than the product itself weighs. Even more so than calenders and Banburys the massiveness of the lead press continues the tradition of the heavy equipment used in the rubber industry. An open view of a typical lead press garden hose is shown in Fig. 2.

No truly continuous process for hose manufacture exists today, to the writer's knowledge. Surely it is not impossible to envision a process in which tubers feed directly to braiders, the braided hose being conveyed through the covering machine and the whole vulcanized as it comes from the latter by some of the newer methods of heating, such as dielectric heating.

Hose design problems are varied. The designer must know the standard factory stocks available and their

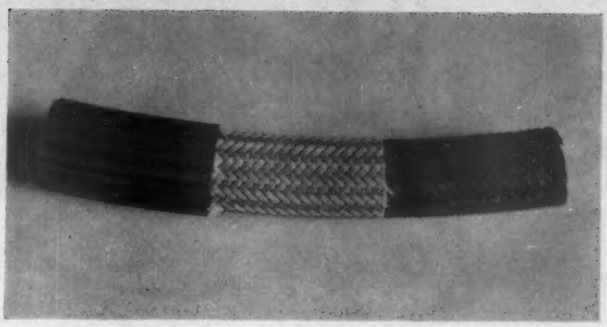


Fig. 2—Lead Press Garden Hose.

tubing, calendering, and building characteristics, as well as their resistance to the fluids to be conveyed. Resistance to abrasion, flexing, and atmospheric cracking are also most important qualities. Certainly not the least consideration is their relative cost. In one case that came to the writer's attention, no less than four quality grades were wanted for the same service.

Hose reinforcing materials available are largely textiles in fabric or yarn form and metallic reinforcement usually in the form of wire. These comments will be limited to the major lines of hose, comprising air, steam, water, gasoline, and garden hose. They all consist essentially of a rubber tube, wrapped fabric or braided yarn reinforcing plies and a rubber cover.

For proper design certain information must be supplied the hose designer. This should include the fluid to be carried, its temperature and pressure, the I.D. and O.D. desired, the color of tube and cover, and the type of coupling.

Knowing the fluid to be carried and its temperature, a selection for the tube stock can be made. Care must be taken that special requirements are fully met. Many customers prefer that sand blast hose be anti-static, either by an inserted wire joining the couplings or by the use of static conducting tube stocks. Likewise, beverage hose tubes must not impart off-flavors. Although tube gauges are often set by specifications, ordinarily they range from about .032 to .250-inch, depending on the severity of the service. For economic reasons, heavy tube gauges are undesirable, but rarely run below .048-inch for hose other than lead press hose. Tubes for the latter are more critical; if thin tube gauges are used undispersed ingredients or foreign material in the stock allow the water used in curing to leach into the carcass and may well ruin more hose than the increased tube gauge would cost. For this reason, lead press hose tube gauges are rarely below .090-inch.

With the tube stock and gauge decided, the reinforcing section is next designed. Either braided or wrapped reinforcement plies may be used; ordinarily, braided hose is more flexible.

The following formulas have been used extensively in hose design, both based on the bursting strength of thin walled sections:

For wrapped hose:

$$\text{Bursting strength (p.s.i.)} = \frac{1.41 \times \text{least tensile strength of fabric in lbs. per in. (warp or fill)} \times \text{No. of plies}}{\text{Mean diameter of hose in inches}}$$

Here the mean diameter is considered to be the mean diameter of the reinforcing section and as such

$$= \text{I. D. (inches)} + 2 \times \text{tube gauge (inches)} + (\text{No. of plies} \times \text{gauge of fabric in inches})$$

This formula has weaknesses in that it gives low results on small hose—say under ¼-inch I.D., and no efficiency factor is provided for the number of plies (which does have a bearing on the burst strength in practice). Furthermore, the method of determining fabric strength is not given. Nevertheless, it is probably the most generally acceptable formula.

For braided hose:

$$\text{Bursting strength (p.s.i.)} = \frac{2 \times \text{Sin braiding angle} \times \text{No. of spools on braider} \times \text{No. of ends on each spool} \times \text{No. of braid plies} \times \text{efficiency factor} \times \text{tensile strength of the yarn (1 end) in lbs.}}{\text{Mean diameter of braid (inches)} \times \text{pitch (in.)}}$$

In most cases an efficiency factor of .75 is satisfactory in the braided hose formula.

A safety factor of 5 is used to protect the hose against large pressure surges. In the case of steam hose, a factor of 10 is frequently used because of the deteriorating effect of heat on cotton.

The above formulas are used to select the fabric or yarn to be used. The size of the braider is selected from the I.D. of the hose to be made. Generally, 24-spool machine is used for sizes up to and including ⅜-inch I.D.; 36-spool for ½-inch and ⅝-inch I.D.; 48-spool for ¾-inch and 1-inch I.D., and 64-spool for over 1-inch I.D.

Although some latitude is permitted in choosing the braiding angle, ordinarily it is kept to 52° to 56° in the finished hose. Although the author has found 52° about the most serviceable, Reece *(2)* considers the best angle to be about 54½°. Suffice to say that in this range contraction or elongation of the hose under internal pressure is at a minimum and the fullest strength of the reinforcement is developed. A further limitation on the designer is imposed by the number of ends of yarn on each spool. Although up to 5 or even 6 ends are used on such specialties as braided vacuum cleaner hose covers, two or three end yarn is usually used in braided hose for easier braiding.

The cotton fabrics used in hose construction vary from light sheetings of approximately 3 oz. per sq. yd. to heavy hose ducks of the 23 oz. type and some cases even 33 oz. In contrast to belt ducks where the strength of the fabric lies largely in the warp ends, hose ducks are made with equal strength in the warp and filling. Cotton warp yarns used for braiding fall in the range 6 count 2 ply to 12 count 10 ply with tensile strengths of 5 to 20 lbs.

There is considerable variation in strength for yarn of the same count, ply, and twist. This leads to trouble with the yarn breaking in the braiders and lower bursting strengths in the finished hose. Although most hose yarn is tested when received, a specified number of samples being taken per case in the lot, such sampling is inaccurate. Possibly a sampling method based on statistical quality control would give more information and prove more useful. This variation is not confined to cotton, but includes other natural fibers. Samples of 2 ply 12 lb. jute yarn tested by the writer showed variations in strength of some 15 lbs.—a wide range when the average strength of the material is considered.

The cover is a most important component of the hose structure. Obviously, it must resist abrasion, sunlight, the fluid being conveyed (in case of spills), and have good tear resistance. Good appearance is very important. Gauges usually vary between .032-inch and .125-inch, the heavier gauges being used on larger sizes and higher quality hose. Although efforts are often made to cheapen hose costs by cover gauge reduction, this is frequently false economy. In lead press hose, thin gauges impair cover adhesion and the cover may often be pulled off in lead stripping. In poled hose, much more care is necessary in handling the thin gauges in cutting and building in the factory.

Practically all hose is tested before shipment. Besides inspection for proper size, color, number of plies, and appearance, hose is tested for adhesion between components, state of cure, and frequently for bursting pressure. Considerable laboratory testing on large volume lines can be dispensed with by using statistical quality control. If this is done testing should be concentrated on raw materials, mixed stocks, and yarns before fabrication to realize the greatest savings. Recent papers by Gnaedinger *(3)* and Oladko *(4)* indicate how this is done.

Co-relation between laboratory tests and service life of hose is not great. Laboratory tests simulating conditions in service should be developed more fully, but keeping in mind the high cost of specialized laboratory apparatus. For example, volume swell in certain fluids for a specified time at a set temperature is often required. Actually, the conditions of immersion, such as surface area, sample dimensions, and aniline point of the fluid, have a considerable bearing on the results obtained. A more practical test requires a section of the hose to be tested by filling it with the fluid and the reduction in I.D. determined by passing ball bearings of different sizes through after a specified test time. Similarly, it is entirely possible in many instances to achieve low volume swell by incorporating the test medium in the rubber compound itself.

We can expect ever widening markets for hose, especially in the industrial field. The techniques and materials available make possible its use in a tremendous variety of applications. Recent uses have included harvesting oysters and cranberry picking by using suction hose. At the same time, more standardization should be attempted to provide basic types of greater general utility. Surely the long list of hose types carried in the rubber conservation orders during the last war is unnecessarily varied.

LITERATURE REFERENCES

(1) U. S. Pat. Nos. 2,097,012 and 2,220,958.

(2) Reece, W. H., "Cotton as a Raw Material for the Rubber Industry," *Trans. Inst. Rubber Ind.*, Vol. 10, No. 2, pp. 101-13 (1934)

(3) Gnaedinger, Paul E., "Quality Control of Factory Mixed Batches of Rubber Compounds," *R. A. (N.Y.)*, Vol. 64, p. 711 (1949).

(4) Oladko, A., "Modern Quality Control Applied to Compounding," *R. A. (N.Y.)*, Vol. 65, p. 44 (1949).

CORRECTION

An error occurred in the statistical factors in the article on "Modern Quality Control Applied to Compounding" which was published in our April, 1949, issue. The statistical factors (bottom of column 1, page 44) should have read as follows:

$$D_4 = 2.11$$
$$D_3 = 0$$
$$A_2 = 0.58$$

An error also occurred in the formula for the "Upper Control Limit for Averages" in the same article (top of column 2, page 44). This formula should have read as follows:

$$UCL_{\bar{x}} = \bar{\bar{X}} + A_2\bar{R} = 1.7231 + (0.58)\ (0.1266) = 1.7936$$

Editorials . . . . . .

Drop in Rubber

THE continued decline in the price of natural rubber is disturbing many quarters, principally the producing interests but also government circles. The average price of spot rubber on the New York Commodity Exchange for the month of July was 16.45 cents and the indications are that the average for August will be considerably less. Despite the declining price trend in natural rubber, synthetic rubber seems to be holding its own percentagewise.

The trend is generally attributed to four causes. These are: (1) The unsolved problem of sterling exchange, with many would-be buyers staying out of the market in the expectation of purchasing more rubber for their dollars if and when the sterling rate is devaluated; (2) The recent influx of cheap Dutch rubber on the market, with many dealers hedging on future contracts against purchase of the cheaper rubber; (3) Impending labor difficulties in the tire manufacturing field, with the companies withholding large purchases in order to escape potential losses in the event of strikes; and (4) The decision of the Senate Appropriations Committee to rescind $275,000,000 in contract authority for stockpile purchases.

Irrespective of the causes responsible for the trend, British rubber interests are initiating a full scale campaign to bring the price of rubber into higher channels. London management circles point out that if prices decline below the present low level, production may have to be curtailed on many of the Malayan and Ceylon estates. Should such curtailment prove necessary, they contend, it would wipe out a considerable portion of the British national income and consequently negate much of the effort being expended by the United States through the ECA program. Furthermore, the argument is advanced that with curtailment of rubber production would come curtailment of employment, thus aiding the spread of communism in Asia.

The importance of natural rubber to the British Commonwealth and particularly Malaya is rarely recognized. A prosperous rubber industry is essential to the entire sterling area. In 1948, for example, Malayan rubber earned about $200,000,000, the largest sum produced by the export of any sterling commodity to the United States. It has long been realized that a large part of the Malayan population depends directly or indirectly on rubber, but it is not too well known that at least a third of the revenue of the Malayan Government is obtained from the same source.

One definite British step in the campaign toward higher prices for natural rubber is shaping up in the form of a world-wide advertising campaign, with the United States as the No. 1 target. An increase in the export tax on Malayan rubber from 0.25 to 0.40 cents a pound has already been authorized, with the additional tithe slated for the advertising campaign. The campaign itself is still in the formulative stage, since the British hope to secure the cooperation of both the Dutch and the French. According to preliminary information, the campaign will be aimed at increasing the consumption of natural rubber through possible new applications, such as the use of rubber in road construction. Although comparisons with synthetic rubber will probably be made, the use of synthetic will not be derided.

The British, and particularly the Malayan planter, are still inclined to blame the mandatory consumption of synthetic rubber in the United States for the plight of the natural rubber industry. It is sometimes difficult to convey the thought that the American synthetic industry is irrevocably tied in with national security and will be maintained in some manner for many a year to come. However, it is not realized that mandatory consumption requirements are under constant review, and that modifications to the existing regulations will continue to be made as conditions permit, as witnessed by the recent modification under which minimum usage of both GR-S and butyl rubber was cut back 7,000 long tons per annum.

It is probably true that the real test between natural and synthetic rubber will not be determined until all legal requirements for the consumption of synthetic are repealed. The key question in the rubber picture has always been just how much synthetic would be consumed in the United States on a purely voluntary basis. Rep. Paul Shafer, chairman of the House subcommittee that wrote the Rubber Act of 1948, believes the time is ripe for that test. He suggests that the United States suspend all mandatory requirements now, with a standby order to be put into effect if synthetic consumption should drop below a safe minimum. With this precaution, he contends, we can secure the answer to the question without any sacrifice to the national security.

It will be a long time before the natural-synthetic controversy comes to a final head. It is doubtful whether any action will be taken at government levels to force the price of natural rubber into higher levels. There seems to be only one answer to the basic rubber problem, one which has been given some thought but not enough action in the past, namely, an all-out campaign to increase the annual consumption of rubber through the development and application of new uses.

CURRENT NEWS OF THE MONTH

MANDATORY USE OF SYNTHETIC EASED IN REVISION OF ORDER R-1

Allocation Order R-1, which specifies the amounts of synthetic rubber required to be used in the manufacture of certain tires and tubes, has been revised, according to a recent statement by the Office of Domestic Commerce, U. S. Department of Commerce.

In accordance with the policy of removing restrictions whenever practical, while providing support of synthetic rubber for national security, truck and bus tires of 7.50 cross-section and larger will no longer have to be made with synthetic rubber. Formerly, these tires had to contain an average of 3% synthetic. At the same time all control over the material used in tire flaps was removed. Bicycle tires also need not be made with synthetic.

The grouping of the tire sizes required to be made with some percentage of synthetic rubber has been revised. There are now only two groups, the first consisting of all passenger, motorcycle and front farm tractor and garden tractor sizes. The two exceptions in this group are tires for airplanes and tires made with special wire construction. In this group are also all tires 7.50 cross-section and smaller used on buses, farm implements, garden implements, and on industrial vehicles.

All of these types of tires must have a minimum amount of synthetic rubber in each individual tire of 5%, while the minimum average for the group must be 45%. In addition, and by way of exception, all truck tires 7.50 and smaller may have as little as 1% synthetic in the individual tire, although the minimum average for the group must still be 45%. Another exception is that tires used on low platform trailers need not be made with any synthetic.

The second group, which must have as much as 55% synthetic in any individual tire with a group average of 80%, consists of all sizes of rear farm tractor and other farm implement tires. An exception is permitted in this group in that tires with spade grip treads for use in cane or rice fields need not have any synthetic.

Other Rubber Order Changes

Another change in Allocation Order R-1 is that a manufacturer must hereafter consume at least 45% butyl rubber in the inner tubes he manufactures in sizes 9.00 and smaller. Previously, manufacturers were required to use 60% butyl in these tube sizes.

These changes in tire specifications do not involve appreciable amounts of synthetic rubber when compared with the total amount of synthetic rubber consumed in these items in a year. It is estimated that the changes will permit manufacturers to use some 7,000 long tons of general-purpose synthetic rubber less than under the previous order. This compares with an estimated yearly consumption of approximately 230,000 long tons of general-purpose synthetic in transportation items.

The change in butyl specifications likewise involves about 7,000 long tons, bringing the required consumption of butyl down to approximately 33,000 tons out of about 50,000 that may be used this year.

Another change in the order requires that certain rubber goods imported into this country must be accompanied by a certificate which states that they contain at least the same percentage of synthetic rubber that domestic manufacturers are required to use in making similar products in this country.

Sheets in Paper Bags

An adequate solution to the packing problem of rubber is reported to have been found in the East Coast district of Sumatra. Rubber sheets are generally shipped in baskets or crates. For some time, however, several large rubber shippers have been conducting experiments on packing rubber in paper bags. Recently, some 25,000 kg of rubber were shipped in this manner to Europe. This new packing method, comprising the use of the much lighter paper as packing material, is said to result in a considerable saving in freight charges and cargo space.

1948 ASTM Proceedings Available

The 1948 Proceedings of the American Society for Testing Materials was recently published by the society. These proceedings are published annually and include all reports and papers offered to the society during the year and accepted by the Administrative Committee on Papers and Publications. The table of contents and subject and author indexes of the latest edition cover all papers and reports published by the society during 1948, which includes papers presented at the Annual Meeting or special meetings, and those accepted for publication in the *A.S.T.M. Bulletin* or as Special Technical Publications. Copies of the 1948 Proceedings can be secured from the A.S.T.M., 1916 Race St., Philadelphia 3, Penna.

SALE AND PRODUCTION OF BLACK DECLINE FROM PREVIOUS TOTALS

According to the Bureau of Mines of the United States Department of the Interior, sales of carbon black fell below production in 1948 for the first time since 1945. Production in 1948 decreased 2% to 1,297,729,000 pounds from the 1,318,965,000 pounds produced in 1947. Sales in 1948 decreased 5% from 1,319,760,000 pounds in 1947 to 1,254,348,000 pounds.

Furnace black production decreased 7%, and for the first time since 1945 was below that of channel blacks which increased 4%. Channel black produced in 1948 totaled 677,133,000 pounds and furnace type 620,596,000 pounds, compared with 653,966,000 pounds, and 664,999,000, respectively, in 1947. The total output of carbon black decreased in all districts except New Mexico and the Texas Panhandle in which increases of 29 and 3%, respectively, were reported.

Rubber company requirements declined for the first time since the 33% slump in 1942. In 1948, 848,075,000 pounds were sold to rubber companies, compared with 943,580,000 pounds of carbon black in 1947. The ink trade remained steady, sales to paint companies decreased by 16%, but sales for miscellaneous uses were almost three times the amount reported in 1947. Exports continued the upward trend begun in 1944, totaling 321,915,000 pounds, compared with 319,076,000 pounds in 1947.

Producers' Stock Increase

Producers stocks of furnace blacks have built up steadily since 1943, the first year they were reported separately, reaching a high of 90,597,000 pounds in 1948, against 66,493,000 pounds in 1947. Stocks of channel black at the plants reached 27,646,000 pounds on December 31, 1948, compared with 8,619,000 pounds at the end of 1947.

The combined value at the plants of channel and furnace carbon blacks increased from 5.36 cents per pound in 1947 to 5.88 cents in 1948, owing to the higher value of channel blacks. Total value of blacks produced during 1948 totaled $76,295,000, against $70,639,000 in 1947. The 1948 average of 5.88 cents per pound was reported to be the highest since 1924.

The number of plants operated during 1948 (63) remained the same as in 1947. One channel plant was added in Louisiana and one in Texas. One plant was shut down in Oklahoma, however, and one in Texas. Four operators were added in 1948, one in Louisiana, one in New Mexico, and two in Texas, and one in Texas ceased operating.

JUSTICE DEPARTMENT CHARGES DECRIED BY DUPONT PRESIDENT

In regard to the anti-trust suit recently filed by the U. S. Department of Justice against E. I. du Pont de Nemours & Co., General Motors Corp., U. S. Rubber Co., two holding companies, and more than a hundred members of the DuPont family, Crawford H. Greenwalt, DuPont president, has sent a statement to some 100.000 company stockholders examining the company's position.

In the statement Mr. Greenwalt pointed out that the central theme of the charge is "that the individual defendants, through their stock ownerships in the various defendant corporations, have required these corporations to purchase goods from each other, thereby serving to restrain trade." He emphatically denied that DuPont's business transactions with either General Motors or U. S. Rubber have been illegal or improper in any sense, or that pressure has ever been exerted by any of the individual defendants on the DuPont management to pursue the course of action alleged by the government.

The government charge alleged that DuPont "subsidized" its expansion "by using for such purpose the profits derived by it from its sale of products on a closed market basis to General Motors and United States Rubber, as well as the profits derived by the DuPont company from its ownership of General Motors stock."

The DuPont president said that this charge has no basis in fact. "DuPont has paid out as dividends a higher percentage of net earnings than has been the case in most industries. Furthermore, dividends from General Motors after taxes have traditionally been passed on intact to DuPont stockholders," he said.

As to DuPont sales, the statement pointed out that the dollar volume as stated by the Department of Justice for the ten-year period 1938 to 1947 totaled $134,000,000 to General Motors and $72,000,000 to U.S. Rubber. These figures, Mr. Greenwalt said, represent 2.6 and 1.4 percent, respectively, of DuPont's total sales during the period to all customers, which amounted to $5,090,000,000. During the same ten years, DuPont's expenditures for new plant construction and equipment were $458,000,000.

Concept of Big Business

Mr. Greenwalt opined that the true purpose of the case was stated by U. S. Attorney General Tom C. Clark when he said it was "directed to the breaking up of the largest single concentration of industrial power in the United States." From this statement, said Mr. Greenwalt, coupled with the nature of the specific charges, "we can only conclude that this suit arises out of a determination by the Department of Justice to attack bigness in business as such."

Contributions by DuPont to the war effort were offered by Mr. Greenwalt as evidence of the job that only big business, with its large concentration of resources, can effectively carry out. "It must be clear to anyone that there are many jobs which can be best accomplished by small business, but that there are others that can be accomplished only by large companies with many resources at their disposal. It is the cooperation between large and small enterprises that has contributed strength and vigor to our economy," he said.

In calling for the support of the stockholders in resisting the government action, Mr. Greenwalt noted that while the charges in the suit are extremely dangerous to the immediately interested parties, the philosophy and way of thinking that lie behind them present an even greater ranger. "The ability of the United States to advance in peace and survive in war is threatened by this contention that bigness is bad in anything but government," he concluded.

Coming Events

Sept. 17. Connecticut Rubber Group, Outing, Scollins Grove, Long Hill, Conn.

Sept. 18-23. American Chemical Society, 116th National Meeting, Atlantic City, N. J.

Sept. 22. Southern Ohio Rubber Group. Engineer's Club, Dayton, Ohio.

Sept. 29. Northern Calif. Rubber Group, Claremont Hotel, Berkeley, Calif.

Oct. 4. Los Angeles Rubber Group, Mayfair Hotel, Los Angeles, Calif.

Oct. 7. Detroit Rubber Group, Detroit-Leland Hotel, Detroit, Mich.

Oct. 10-14. A.S.T.M., West Coast Meeting, Fairmont Hotel, San Francisco, Calif.

Oct. 14. Boston Rubber Group, Somerset Hotel, Boston, Mass.

Oct. 21. N. Y. Rubber Group, Henry Hudson Hotel, New York City.

Oct. 24-28. 37th National Safety Congress and Exposition, Chicago, Ill.

Nov. 1. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Calif.

Dec. 9. Detroit Rubber Group, Detroit-Leland Hotel, Detroit, Mich.

Dec. 10. Southern Ohio Rubber Group, Miami Valley Golf Club, Dayton, Ohio.

Dec. 16. N. Y. Rubber Group, Henry Hudson Hotel, New York City.

Dec. 16. Boston Rubber Group, Somerset Hotel, Boston, Mass.

Reel Returns From Abroad

Economic conditions in Europe have improved considerably as compared with last year, Ralph M. Reel, technical service manager of the Dayton Rubber Export Co., Dayton, Ohio, reported on his recent return from a tour of Europe. Marshall Plan aid plus the efforts of the people themselves has brought marked improvement in all the nations visited except Spain, he said. Mr. Reel spent three months in Europe to contact and service various European companies to whom Dayton renders technical assistance.

FTC RECOMMENDS CARBEXPORT CONFORM TO ANTI-TRUST LAWS

The Federal Trade Commission recently concluded its five-year investigation of Carbon Black Export, Inc., 55 Fifth Avenue, New York, N. Y., with a recommendation that it readjust its business practices to conform to the anti-trust laws. The company handles approximately 85% of this nation's export of channel type carbon black. Carbexport, as the organization is familiarly known, is a trade association operating as the exclusive selling agent for exports of channel black produced by its members. It also handles non-member exports for an agent's commission.

Distribution Cleared

The FTC gave the trade association, organized under the Webb-Pomerene Law, a clean bill of health regarding its methods of distributing carbon black. However, the commission found fault with other practices of the association and gave it 30 days to elect to comply with its recommendations. Carbexport, the commission ruled, must refrain from entering into agreements with non-members to sell only at fixed prices or to limit the quantity, through a quota, of their exports. It also enjoined the association to "cease and desist" from entering any agreement intentionally affecting domestic production of carbon black.

The commission said that Carbexport and a domestic trade organization, the National Gas Products Association, had the same officers and shared office space. It found this relationship "incompatible with the independence of these two groups," and ruled that it be dissolved.

Membership Agreements

According to a contract with its members, Carbexport was authorized to buy no more than 10% of its annual export requirements from non-members. The commission also found that the association made overtures to prospective new stockholders which resulted in trial operations extending from three to nine years. This, said the FTC, resulted in the enjoyment "of all the advantages of membership without the necessity of making an investment." These benefits conferred on such non-members "were lawfully attainable only by compliance with the Export Trade Act," claimed the commission. Therefore, the commission ruled that the association must "not make membership overtures to prospective new stockholders conditioned upon trial operations."

It also found that the association's "extension of price maintenance policy to non-member competitors by way of procuring intention to cooperate and assurances to follow the association's prices closely," was not in conformity with the principle of the Export Trade Act.

Stockholder members of Carbon Black Export, Inc., include United Carbon, Columbian Carbon, Godfrey L. Cabot, J. M. Huber, Panhandle Carbon, and Charles Eneu Johnson.

Sun Rubber Refutes Rumors

Rumors which have been circulated in recent weeks pertaining to the dissolution of the Sun Rubber Co., Barberton, Ohio, have been refuted in a statement issued by the company. The dissolution of an inactive subsidiary and a fire in another firm's warehouse gave rise to unfounded fears for the company's business. Company officials stated that a separate corporation organized by Sun during the war to expedite the handling of special services for the Government is now being dissolved. Known as the Sun Rubber Products Co., it was never active. The rapid changes made in Government planning and procedures as the nation geared itself for war did away with the necessity for the subsidiary shortly after it was organized. Its dissolution is being undertaken merely for accounting, legal, and organizational purposes, officials said. A $100,000 stock of crude rubber, compounding materials, cartons and packaging supplies was destroyed in a fire which raged through the American Vitrified Products Co. plant on June 29. This plant is located about a mile from the Sun plant. Sun used part of American's space as a reserve warehouse to eliminate overcrowding its own main warehouse. The entire loss was fully covered by insurance, and Sun has more than adequate stock for current production on hand at its factory.

Tensilite 300 Plastic Laminate

A new high pressure plastic laminate which is said to possess definite advantages over conventional laminates for certain electrical insulations has been developed by the Plastics Division of J. P. Lewis Co., Beaver Falls, N. Y. Called Tensilite 300, it is the result of a manufacturing technique in which a new type of virgin pulp paper is combined with Hycar rubber, phenolic resin, and other compounding ingredients to form a low cost plastic sheet comparable to normal NEMA grades. Laminated in a conventional manner, Tensilite 300 may be fabricated by sawing, shaving, drilling and punching, with the latter done cold or warm, but not in excess of 160° F., depending on the technique and intricacy of the part. Furnished in sheets from 0.031 to 1.0 inch thick, it comes in two colors, dark brown or black, and in two finishes, satin or dull.

Construct New DuPont Laboratory

With a ground-breaking ceremony on July 12, the Fabrics and Finishes Department of E. I. du Pont de Nemours & Co., Inc., began construction of a new research laboratory in South Philadelphia, Penna. Scheduled for completion late next year, the structure will cost $2,000,000 and will replace laboratory facilities now located in three different buildings. Providing facilities for 80 technical employees and 105 other workers, the new laboratory will be equipped with the latest scientific research facilities.

Foamex Lined Seclusion Room

A room completely cushioned with Foamex, foamed latex supplied by Firestone Industrial Products Co., Akron, Ohio, has inaugurated a positive, more humane approach to the problem of care for disturbed patients in mental institutions. This innovation not only protects the patients against self-injury, but

also eliminates the need for restraints. The room, designed to provide maximum safety, comfort and freedom of movement has successfully undergone initial tests at Cleveland State Hospital, Cleveland, Ohio. Research on the new room was begun in the latter part of 1946 by Firestone chemists at the request of Psychiatric Installations, Inc., Cleveland, Ohio, distributors of the products. Special types of Foamex cushioning, a tough durable fabric covering, and a flame-resistant, practically impervious latex covering were developed by Firestone scientists in the project. At the same time, a non-injurious, rubber-mounted screen, which eliminates the need for barred grilles, was developed for windows of the room.

Introduce Burgess Polyclay

Burgess Polyclay, a water-washed clay of highly uniform particle size, constant pH, and excellent color, has been introduced to the rubber industry by the Burgess Pigment Co., Paterson, N. J. When used with GR-S, Polyclay is said to reduce milling and refining time, to make possible good extrusions and calendering at low temperatures, and to assure smoother extrusions at higher extruding speeds. Burgess pigments are distributed to the rubber field by Sharples Chemicals Inc.

Greeff Representing Vanderbilt

R. W. Greeff & Co., Ltd., 12 Finsbury Circus, London, E. C. 2, England, has been appointed sales representative in Great Britain, Northern Ireland and Eire for the R. T. Vanderbilt Co., Inc., of New York City. The Greeff organization also maintains a branch office at the Royal Exchange in Manchester, England.

Silastic Coated Fiberglas Tape

A new insulating tape especially manufactured for application by vulcanization has been announced by the Irvington Varnish & Insulator Co., Irvington, N. J. Known as Type R-12 and R-20 Silastic Tape, it consists of Fiberglas cloth impregnated and coated on both sides with Silastic rubber. On one side of the tape, the Silastic rubber has been completely cured; on the other, it has been only semi-cured. As a result, when the tape is applied as insulation and heated for vulcanizing, a solid mass of insulation is formed, free of voids and air spaces.

When applied and cured properly, the R-12 and R-20 Silastic Tapes possess many properties important to the successful use of a dielectric under various sets of service conditions. From —70 to 500° F., the Silastic Tape retains physical, chemical and dielectric properties. It has a dielectric strength of 450 volts per mil (¼-inch electrodes). Uncured, the tape has a tensile strength of 60 pounds per 1 inch width.

The Silastic tape vulcanizes in 15 minutes at 260° F. It can be vulcanized and cured in use if operating temperatures are sufficiently high. It may also be vulcanized in a steam autoclave, vulcanization being completed in 3 to 5 minutes at a steam pressure of 50 psi.

Airpak Shipping Container

A rubber-cushioned steel shipping shell that will protect jet aircraft engines from damage by jars and jolts has been announced by the Firestone Tire & Rubber Co., Akron, Ohio. The airtight steel container is pressurized to protect the engine from the damaging effects of humid air. It is cradled on rubber air springs which are designed to absorb practically all shipping shocks by floating the engine on an air cushion. These shipping and storage containers, known as Airpaks, are being made by Firestone for Westinghouse J34 aircraft engines. Each measures 138 inches in length and 47 inches in diameter. Each cylindrical container is made in two sections which encase the jet engine. After the engine is belted into the container, the unit is sealed, pressurized and mounted on skids with a specially designed rubber air spring suspension system. These air springs virtually float the engine and its container on air. By adjusting the air pressure in the rubber pneumatic spring unit, resistance to varying shock forces can be controlled.

Secures Electroforming Units

The F. A. Ringler Co., sole licensee under U. S. Rubber Co. patents for the electrodeposition of iron in the construction of electroforms, has acquired the business, plant and facilities of the rubber company's Electroforming Division at 15 Merwin St., Norwalk, Conn. The Ringler concern will continue the business at the Norwalk plant, augmented by the manufacture of large size electroformed iron molds for the aircraft and automotive industries.

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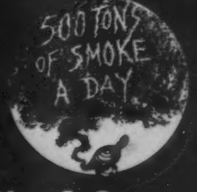

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13TH ANNUAL SUMMER OUTING HELD BY BOSTON RUBBER GROUP

Approximately 400 members and guests attended the 13th annual summer outing of the Boston Rubber Group held this year on June 24 at the United Shoe County Club in Beverly, Mass. Sports activities began at 12:00 noon, and consisted of golf, softball, bowling, tennis, darts, and other activities. Each person attending received a door prize. Dinner was served in the evening, when winners of sports contests were announced and prizes distributed. Winners of the different golfing events included the following:

Kicker's Handicap, R. B. Patterson (Hood Rubber), C. J. Reckles, J. J. Breen (Goodrich Chemical), R. O. Babbitt (R. T. Vanderbilt), John Hussey (Goodyear), Carl Mayerhauser (N. J. Zinc), Allen Richards (Dewey & Almy); *Low Gross,* A. E. Nelson (Hood); W. A. Maguire (United Carbon), Phil Salamon (Binney & Smith), C. H. Hamilton (Raffi & Swanson), and H. P. Bainbridge (Boston Varnish).

Low Net, L. L. Longworth (Monsanto), F. N. Barrett (Whitman Plastics), R. Tedford (General Latex & Chemical), E. W. Kisher; *Nearest Pin on 6th Hole,* C. J. Reckles, C. H. Hamilton; *Longest Drive on the 18th Hole,* A. R. Loosli (Calco Chemical); *Highest Score on 6th Hole,* Allen Richards (Dewey & Almy); *Highest Net Score,* Al T. Johnson; *Highest Gross Score,* Fred DeBaggio (Hodgman Rubber)

The softball game was won by a team representing the Stedfast Rubber Co. captained by T. Freeman. Winners of other sporting events included: *Horseshoes:* P. L. Blanchard (Hood Rubber) and J. C. Cameron (Hood Rubber); *Tennis,* J. LaBelle (Koppers) and E. Dannenberg (Godfrey L. Cabot); *Darts,* E. Pease (Sun Oil) and C. M. Grafton (Goodall-Sanford); *Bowling,* J. M. Washburn (Emery Industries), E. Covell (Stedfast Rubber), L. Clark (Haartz-Mason), J. Holland (Tyer Rubber), W. Anderson (Simplex Wire), G. Herbert (Tyer Rubber).

The Outing Committee included: *Chairman:* John Andrews (Godfrey L. Cabot), Edward Covell (Stedfast), and Harry Atwater (Hood Rubber).

A.S.T.M. Holds 52nd Meeting

The 52nd Annual Meeting of the American Society for Testing Materials was held in Atlantic City, N. J., from June 27 to July 1. Some 185 papers and reports were presented, and 77 new tentative specifications and methods were approved. The registration of 1857, not including about 330 ladies, was the second highest achieved to date, exceeded only by the 1944 meeting at New York. James G. Morrow, metallurgical engineer of the Steel Co. of Canada, Ltd., Hamilton, Ont., was elected president for 1949-50, and Frank E. Richart, Research Professor of Engineering Materials at the University of Illinois, was elected vice-president. A full report on the meeting of Committee D-11 on Rubber will appear in an early issue.

Cake Named Plantation Head

W. E. Cake

Appointment of W. E. Cake as managing director of the Plantation Division of the U. S. Rubber Co., was recently announced by the company. Mr. Cake, formerly assistant managing director of the division, succeeds I. W. Bicknell who retired for reasons of health after 39 years of service. A native of Lake Linden, Mich., Mr. Cake joined U. S. Rubber in 1922 as a chemist after receiving degrees from the University of Michigan. He went immediately to the company's rubber plantations in the Far East. Except for periodic leaves of absence, he spent 23 years in Sumatra and Malaya. He pioneered in chemical research on the rubber estates and became director of the Plantation Research Department in 1930. During World War II, Mr. Cake was taken prisoner by the Japanese and was interned for three years on Sumatra. Soon after his return to this country in 1945, he was appointed assistant managing director of the Plantation Division.

Two New Acids Available

The B. F. Goodrich Chemical Co., Cleveland 15, Ohio, has announced the availability of Beta-Chloropropionic acid and Beta-Mercaptopropionic acid in experimental quantities. Beta-Chloropropionic acid undergoes the usual reactions of carboxylic acids such as esterification, amide formation and salt formation in addition to the reactions possible with the active chlorine. It is available as a white crystalline water soluble solid, melting at 36° to 39° C. Beta-Mercaptopropionic acid is available for the first time to the chemical industry. It reacts both as a carboxylic acid and as a mercaptan. With a purity of approximately 99%, it is available as a water soluble liquid distilling at 114° to 115.5° C. at 13 mm. These chemicals may have valuable properties as offered and may also be used as intermediates for the synthesis of new and unusual organic chemicals.

GOLF TOURNAMENT FEATURES ANNUAL CHICAGO GROUP OUTING

A golf tournament featured the annual outing of the Chicago Rubber Group held on July 9, at St. Andrews Country Club, West Chicago, Ill. Dinner was served at the conclusion of the day's athletic activities at which time prizes were distributed to winners of the different events. Door prizes were also distributed to members and their guests. Golf tournament winners included:

Low Gross, L. B. Wagner (Metropolitan Golf Ball). Mr. Wagner was the winner of the United Carbon Trophy for the second time. *2nd Low Gross;* Joe Smith (Kraft Chemical); *3rd Low Gross;* Jim Adams (Sears Roebuck); *High Gross;* H. Irwin (Marbon); *Closest to Cup;* Joe Showalter (Marbon); *Longest Drive;* Paul Lance (Syracuse Rubber); *Most 5's;* Francis Frost (Frost Rubber); *Most 6's;* E. Fik; *Most 7's; A Wiegman.*

The Outing Committee consisted of: *Chairman;* A. E. Lawrence (Phillips Chemical); and John Groot (Dryden Rubber; Harold Stark (Dryden Rubber); William Fairclough (Enjay); Charles Wonder (Van Cleef Bros.); and Maurice J. O'Conner.

Plan Plant Maintenance Show

A fifteen-man board of leading industrialists and editors to act as an advisory group for the first Plant Maintenance Show, which will be held in the Auditorium, Cleveland, Ohio, January 16 to 19, 1950, inclusive, was recently announced by the exposition management. L. C. Morrow, Editor, *Factory Management and Maintenance,* will serve as general chairman of the advisory board as well as of the four-day conference on plant maintenance methods which will be held concurrently with the show. Some 50 companies have already reserved space and it is expected that several times that number will be represented when the show opens in January.

Chicago Rubber Group Officers

As the result of a recent letter-ballot, the following officers were elected to head the Chicago Rubber Group for the 1949-50 season: *Chairman,* Walter H. Peterson (Enjay); *Vice-Chairman,* Paul F. Niessen (Victor Mfg. & Gasket); *Secretary-Treasurer,* Maurice J. O'Connor (C. P. Hall). Members of the board of directors include: H. E. Andersen (Goodrich Chemical), R. E. Elliott (Indoil Chemical), J. B. Ledden (DuPont), R. K. Opper (Naugatuck Chemical), L. W. Heide (Acadia Synthetic Products), V. J. La Brecque (Victor Mfg. & Gasket), C. H. Skuza (Inland Rubber), and Walter Wood (Salisbury).

Another "Cold Rubber" Plant

The synthetic rubber plant operated for the Government at Port Neches, Texas, by the B. F. Goodrich Chemical Co., was scheduled to begin production of low temperature polymerized GR-S in August, following the installation of necessary refrigerating equipment.

NEWS IN BRIEF

Caslen, a new curled casein fiber which is said to be cheaper than the best quality horsehair, equally resilient, and much more dependably uniform, is currently being produced by the Rubberset Co.

The use of silicone greases as ball bearing lubricants is described in two new publications recently made available by the Dow Corning Corp., Midland Mich. Properties, performance and applications are covered. The data is contained in Silicone Notes Nos. D-5 and D-6.

The industrial model and fabrication services offered by the Marco Manufacturing Co., Akron, are described and illustrated in a new four-page folder issued by the company. Rubber is one of the several industries served by the organization.

Making use of a new 2 mil cast vinyl film produced by Goodyear, the Boland Manufacturing Co., Winona, Minn., is marketing attractive table cloths in a wide range of colors and patterns.

Keller Products, Inc., Cleveland, has announced the development of Tub-Kove Sealing Strip, an easy to apply product made from Geon that seals and covers cracks at junctions of walls and bathtub, washbowl, stall showers, etc.

Firestone Industrial Products has announced reductions of $10 to $20 in its suggested retail prices of Foamex mattresses. Under the new price schedule, the 4½-inch Foamex mattress will sell at $79.50, while the 3-inch standard will retail at $69.50.

Elasto-Rib, a low cost cork and rubber mounting which requires no bolting or cementing, is described in a new bulletin recently released by the Korfund Co., Inc., Long Island City 1, N. Y.

The Smithsonian Institution, Washington, D. C., has installed a permanent display featuring Goodyear's cross-wind landing wheel in an exhibit prepared at the request of the National Air Museum.

DuPont Rubber Chemicals has made available a technical bulletin on the use of Neoprene Type S in neoprene compounds for low temperature service. Ask for Report BL-232.

Exclusive right to make and distribute mattresses and other sleep equipment with Goodyear's Airfoam has been obtained by the Englander Co., Inc., national manufacturer of bedding. The agreement makes it possible for Englander to market as fair trade items a complete line of new mattresses using the latex foam sponge.

Tribute is paid the nation's research chemists in the rubber industry by an article appearing in the current issue of *The Laboratory*, house organ of the Fisher Scientific Co., Pittsburgh, Penna., Developments leading to the commercial application of "cold rubber" are discussed.

Vee-Ply belting, a quick detachable V-belt, has been added to the V-belt drive line featured by the Worthington Pump and Machinery Corp. Designed to service emergency break-downs, and to eliminate a large, endless belt inventory, the new type belting can be adapted to most V-belt drive applications.

Considerable reductions in price have been announced by Monsanto Chemical on its improved crystalline calcium nitrate. The price on these crystals has been reduced as much as 50 percent on orders of 20,000 pounds or more, with favorable reductions made on smaller quantities.

Cushion curlers of Geon have been developed and introduced by Anitra Products of Palm Springs, Calif. The curlers are said to be soft and pliable, and may be put on an entire head of hair in a matter of minutes.

Data on selling under the Marshall Plan has been made available by the Economic Cooperation Administration, Washington 25, D. C., in a booklet entitled "Information for American Businessmen on the Marshall Plan." Copies are available on request.

A Hycar rubber-faced plug is one of several features built into an easy operating plug valve now being manufactured by the DeZurik Shower Co., Sartell, Minn. The valve is designed for both high and low vacuum service carrying gases or liquids. The rubber face of the plug eliminates dripping.

A maintenance checking chart for roofs, floors, stair treads, insulation, etc., has been made available by United Laboratories, Inc., Cleveland 12, Ohio. It contains information of interest to plant and building maintenance superintendents.

A new general bulletin describing and illustrating its line of plastic fabricating machines has been issued by the Taber Instrument Corp., North Tonawanda, N. Y. Both the Thermofolder and Thermobeader units are included.

General Electric recently announced the sale of its cold molded plastics business to the Garfield Manufacturing Co., of Garfield, N. J. The sale was the final phase in the closing of the company's plastics plant at Meriden, Conn.

American Cynamid has announced pilot plant production of cyanuric chloride which, among other applications, offers possibilities for rubber chemicals. A 30-page technical booklet is available from the company on the physical and chemical characteristics of the product, as well as suggested uses.

Goodrich has announced the availability of flexible glazing strips made of Koroseal for metal windows of both the fixed and storm types. The strips are extruded to customer's specifications from a special compound which has already been found suitable as a gasket in an all-metal house.

Fire safety during plant shut-downs is the subject of a bulletin recently issued by the Engineering Division of the Associated Factory Mutual Fire Insurance Companies, Boston. Based on actual fire experience, it lists those items requiring special attention and outlines precautions needed during the shut-down.

Monsanto Chemical Co. has transferred its offices for the sale of lampblack and bone ash from New York to Boston, Mass. Only exception to the change applies to orders originating in metropolitan New York, including New Jersey, north of Trenton.

A new type of carpet in which weaving is eliminated by cementing the tufts to a heavy cloth backing has been announced by Pioneer Carpet Mills Corp. The new carpet is held together with a special adhesive developed by U. S. Rubber.

Reliance Electric & Engineering Co., Cleveland, has issued a new two-page bulletin describing and illustrating its improved Section Interlock Regulator. This unit is designed to provide precision speed control for coordinated motor drives used in processing at high speed various materials in web form.

A series of reprints of articles appearing in current national trade magazines on the subject of battery maintenance has been made available by the Gould Storage Battery Co., Trenton, N. J. Maintenance data on both cycle-duty and stationary batteries is included.

Readi-Sol is the name of a new all-purpose metal cleaner developed by the Preventive Maintenance Co., Bridgeport, Conn., makes of the well-known Rubber Flo Mold Lubricant. The new cleaner can be used either as a spray or painted on with a brush and is said to work effectively on all metal parts, machines, tanks, cars, motors, etc.

Jenkins Brothers have leased the entire thirtieth floor in the tower of the thirty-six story office building now being erected at 100 Park Avenue, New York, as new company headquarters. The 85-year-old valve manufacturing concern has its manufacturing facilities and plant in Bridgeport, Conn.

PLASTICIZER OUTPUT INCREASES 3% REPORTS TARIFF COMMISSION

Production of plasticizers, aromatic and naphthenic products, and miscellaneous chemicals improved during 1948, countering the declining trend shown by butadiene, according to additional reports recently issued by the U. S. Tariff Commission. Plasticizer output amounted to 145,000,000 pounds, an increase of 3% over 1947, and 120,000,000 pounds were sold for $48,000,000, slightly more in quantity and price than in the previous year.

Some 892,000,000 pounds of aromatic and naphthenic products were turned out, 40% more than in 1947, and sales amounted to 687,000,000 pounds valued at $26,000,000. Butadiene, however, dropped to 661,000,000 pounds. Domestic production of miscellaneous chemicals amounted to 12,000,000,000 pounds, up 20%, but sales at 5,000,000,000 pounds, worth $706,000,000, were off from 1947.

Output of all cyclic plasticizers totaled 107,000,000 pounds, a small increase over production in 1947. Sales were 89,000,000 pounds valued at $35,000,000, also a little higher. Production of dibutyl phthalate, the most important individual cyclic plasticizer, was 16,000,000 pounds in 1948, compared with 22,000,000 pounds in 1947. Production of diethyl phthalate was 6,000,000 pounds, compared with 8,000,000 in the previous year.

Production of acyclic plasticizers reached 38,000,000 pounds in 1948, compared with 37,000,000 pounds in 1947. Sales, which were about the same as in 1947, amounted to 30,000,000 pounds, valued at $13,000,000. Glyceryl monostearate was produced in larger quantity than any other plasticizer in the acyclic group.

Toluene Production Rises

Principal chemicals for which increased production was reported in 1948 were toluene and xylene. Output of toluene was 161,000,000 pounds larger than the 198,000,000 pounds produced in 1947, and the output of xylene was 144,000,000 pounds larger than the 239,000,000 pounds produced in 1947.

Production of C3 hydrocarbons (propane and propylene) amounted to 714,000,000 pounds, about 250,000,000 larger than the 1947 output. The greater part of this material was converted into isopropyl alcohol for the manufacture of acetone. Production of ethylene, 383,000,000 pounds, was 12% greater than in 1947.

Output of miscellaneous cyclic chemicals,, chiefly insecticides, photographic chemicals, plant hormones, paint driers, and synthetic tanning materials, declined to 200,000,000 pounds in 1948, 5,000,000 pounds less than in 1947. Sales at 169,000,000 pounds, were slightly larger, but their value at $60,000,000 was somewhat smaller.

Production of miscellaneous acyclic chemicals, consisting chiefly of solvents, refrigerants and acyclic intermediates, totaled 11,800,000,000 pounds, an increase of 2,000,000,000 pounds over the output in 1947. Sales totaled 5,000,000,000 pounds valued at $646,000,000.

ADDITIONAL CHANGES ANNOUNCED BY THE SCHRADER ORGANIZATION

H. F. Walters G. W. Gross R. Rounds

In accordance with recent changes in personnel and assignments at A. Schrader's Son Division of the Scovill Manufacturing Co., 470 Vanderbilt Ave., Brooklyn 17, N. Y., George W. Gross has been appointed works manager of the division including domestic, branch and foreign plants. Mr. Gross joined the Schrader organization in 1923 and, after four years at the Brooklyn plant, went to the Akron Branch as superintendent of a manufacturing unit. He returned to Brooklyn in 1930 as assistant superintendent in charge of manufacturing and equipment.

In 1934, after a year at the Canadian plant, where he developed production facilities for specialties production for Scovill, Mr. Gross went to England to work out an engineered production layout for the Schrader plant in Birmingham for the purpose of coordinating manufacturing facilities. Back in the United States, he was appointed superintendent on January 1, 1945.

Mr. Gross has been succeeded as manufacturing superintendent by Robert Rounds. Mr. Rounds joined Schrader in 1927, and worked in the Engineering Department as product designer. He spent two years in the Akron Branch and was assistant to the service manager. From 1942 to 1945, he headed the Work Simplification Division of the Engineering Department at Schrader's Brooklyn plant. From 1945 to 1949, he was quality control manager of that plant. Early in 1949, and prior to his present appointment, he was assistant production manager.

H. F. Walters is the new assistant production manager, succeeding Mr. Rounds. Mr. Walters joined Schrader in 1920 in the Billing Division of the Order Department. From 1924 to 1931 he installed and supervised the Finished Stock Perpetual Inventory System. From 1932 to 1948 he set up and supervised manufacturing control records, and was assistant stores and priorities manager. In 1949 he became stores manager, a position he held until his present appointment.

Wing-Stay S Rubber Chemicals

A new family of rubber chemicals, to be known as Wing-Stay S, said to have excellent antioxidant and superior nonstaining and non-discoloring properties, has been developed by the Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio. Now available in production quantities, the new material, an amber liquid, may be used in both natural and synthetic rubber. Chemical Division officials said additions to this new chemical family will be made as they are developed.

Reorganize Randall Company

Amy Randall Gardner has purchased from Mary S. Sweeney the latter's entire interest in the Frank E. Randall Company of Waltham, Mass. The former partnership has been dissolved and the company has been incorporated under the laws of Massachusetts. The Frank E. Randall Co., Inc., will continue the manufacture of the well-known "Randall & Stickney" dial gauges and indicators. Francis Gardner is president and manager of the reorganized firm.

Rubber Zippers on Train

The world's most modern streamlined railroad train, manufactured by the American Car and Foundry Company, is "zippered" together by ingenious rubber diaphragms housing pressure-sealing zipper fasteners made by The B. F. Goodrich Company. The train, called the "American Talgo," is to be tested and demonstrated across the nation. Each coach has only one pair of wheels in the rear. The rubber members, fabricated of sheet and sponge rubber, form the outer wall of the revolutionary articulated train at points where the cars are coupled resulting in a smooth outer surface throughout the length of the train. The zipper fasteners, developed by the rubber company for military use during World War II, enable rapid coupling and uncoupling of the cars and prevent the entrance of dust and moisture, according to Goodrich engineers who began work on the special rubber devices in 1946.

In addition to the outer diaphragms at the car junctions, a second rubber diaphragm is employed forming the inner wall where the cars are connected. The new train is air conditioned.

Electronic Curing of Tubing

According to the B. F. Goodrich Co., the unit illustrated herewith, located at plant 4 in Akron, has cured over 9,000,000 feet of red syringe tubing electronically during the past 18 months. The method and apparatus for continuous curing of strip, channel and tube stock were developed by the company's machine and process development division, and patents have been secured. Production of goods from mixing mill to box car in 20 minutes is visualized by the company in the near future.

Mansfield in Vinyl Production

Mansfield Tire & Rubber Co., Mansfield, Ohio, has announced that the first runs of vinyl film have been completed, shipments have been started, and three shift leaders have been appointed. First material turned out was the translucent or "frosted" vinyl film. Approximately 15,000 pounds, or 60,000 yards, of the material will be manufactured each day when production reaches its peak. At present, only one calender has been modified for the processing of vinyl film, but work is being rushed on two additional units.

Buffalo Group Summer Outing

Rain curtailed some of the athletic activities planned for the annual outing of the Buffalo Rubber Group held on July 30 at the Lancaster Country Club, Buffalo, N. Y. Prizes were distributed for those contests which managed to get under way including golf, horseshoes and darts. The remainder of the prizes which had been scheduled for distribution to contest winners were distributed as door prizes. A steak dinner and card games completed the day's activities.

Engineers to Visit United States

The Economic Cooperating Administration is assisting in bringing approximately 50 British engineers to the United States for one year of graduate study in leading technical schools and on-the-job training in factories to learn American production methods. The training project, undertaken with the cooperation of the British Government, is part of ECA's technical assistance program.

Causes of Accidents

Sixteen percent of all highway accidents in the United States are caused by some mechanical defect prompted by driver neglect which could, and should have been remedied, according to James J. Newman, vice-president of the B. F. Goodrich Co. and Chairman of the Inter-Industry Highway Safety Committee. Bad brakes, burned-out head or tail lights, unworkable windshield wipers, and unsafe tires are only a few of the factors that can cause accidents unless they are remedied.

More News in Brief

As a tribute to the golden anniversary of the Packard Motor Car Co. the B. F. Goodrich Co. has prepared a special brochure designed to acquaint its organization with the highlites which have made Packard outstanding in American industry.

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Esters of glycerol and many gycols and polyglycols are treated in a new brochure recently made available by the Glyco Products Co., Brooklyn, N. Y. The brochure includes tables of physical properties and uses of certain higher fatty acid esters.

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Goodyear has perfected a new hydraulic tire remover which should prove a great time and labor saver in changing large earthmover tires. Especially designed to facilitate the breaking loose of these giant tires' beads from the rims, the tool will operate on any tapered bead rim of Goodyear design.

—

Magnolia Metal Co., Elizabeth 4, N.J., has issued a leaflet describing its new D-Z-L heavy duty, genuine babbitt for sleeve bearings subject to combined weight, heat and shock. The company has also published a new price list covering die-cast bronze bearings for replacement service on Nos. 3-A, 9 and 11 Banbury mixers.

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"Magazine Clippings Aid Business" is the title of a new booklet issued by Bacon's Clipping Bureau, Chicago 4, Ill., which tells how business organizations, manufacturers, associations, etc., are using clippings from business papers, technical journals, general magazines, etc., for making research and market studies.

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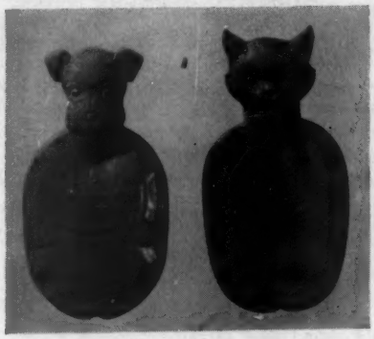
A new 4-page bulletin giving factual information about its line of heavy-duty industrial safety switches is available from the Trumbull Electric Mfg. Co., Plainville, Conn. Information is furnished on types of applications, extent of the line, horsepower ratings, etc.

Water Bottles for Children

Character water bottles, for small children, in puppy and kitten designs are again being merchandised by the Sundries Department of the B. F. Goodrich Co., Akron, Ohio. Introduced a short time before the outbreak of World War II, the bottles had become immensely popular when their manufacture had to be curtailed because of the war. The bottles are practical for the baby's nursery or sick room, are of molded construction and have a capacity of one pint. Both the puppy and kitten designs are made in blue and pink.



Develop New Rubber Bearing

Development of a new rubber bearing which is said to radically simply the design of oil well pumping units has been announced by the U. S. Rubber Co., New York 20, N. Y. The new bearing, which is used in the evener assembly, reduced from 100 to 38 the number of parts required for pumping unit construction. Research and development work on the bearing was carried out simultaneously at the Fort Wayne, Ind., plant of U. S. Rubber and at Cabot Shops, Inc., Pampa, Texas. A special test unit with rubber evener bearing assembly was constructed at Cabot Shops, given a severe unbalanced load and operated at three times normal field operating speed. The rubber evener bearing, under these unusual operating conditions, completed more than 40,000,000 cycles, outwore many of the structural metal parts in the unit and still maintained serviceable operating condition.

Spiratube Flexible Tubing

A new type of flexible tubing for air, gases, powdered, granular or other light solids, is currently being manufactured by the Flexible Tubing Corp. of Branford, Conn. Called Spiratube, it is reported to be "spiral-stitched" to provide flexibility, non-collapsibility under plus or minus pressure, easy retractibility, efficiency, convenience and long life. Specifically, Spiratube consists of a flexible tubing, made of fabric, sewed around a coiled-spring reinforcement. The standard fabric covering is cotton duck which is coated and friction calendered with approximately 14 ounces of flame-proofed neoprene latex per square yard. The fabric has a bursting strength of approximately 170 psi and may be used in temperatures ranging from —30°F. to 250°F.

PROGRAM FOR QUALITY STANDARDS BEING SPONSORED BY NAVY DEPT.

The desirability of establishing standards for acceptance of rubber products having minor and major visual defects has long been recognized, and toward this end the broad requirements of workmanship and quality presently contained in specifications should be amplified with measurable standards or better guides to their judgment, according to the Bureau of Ships of the Navy Department.

According to the Bureau, a classification of visible imperfections would insure a greater uniformity of inspection and a more equitable treatment of all manufacturers as well as assuring more uniform acceptable products for Navy use. Such a compendium has been prepared covering the visible defects found in rubber hose ("Standard Inspection Procedure for Rubber Hose," Navships 250-344, April 1948, and "Typical Visible Defects Found in Various Types of Rubber Hose," by T. A. Werkenthin, appearing in RUBBER AGE, May, 1948).

In order to extend this coverage to rubber products other than hose, the Bureau of Ships is planning to collect samples showing all types of defects, both major and minor, which may occur in the daily manufacturing processes of numerous rubber products. Typical defects would be those resulting from incorrect use or improper functioning of mechanical equipment, imperfections in the material used, faulty workmanship, deviations in compounding, or fluctuations in the conditions under which the article is produced.

It should be emphasized that in order to provide a comprehensive survey, the desired samples will include those which have defects or conditions which normally would cause rejection before coming to the attention of final inspectors.

The success of the proposed program is dependent upon the cooperation of the rubber manufacturers, rubber plant inspectors, personnel of the Naval laboratories, and Naval inspectors. Samples should be obtained and/or photographed to illustrate clearly a complete range of imperfections for each of the broad classifications of rubber materials listed below:

(1) Gaskets and Packing — Molded Stock, Sheet Stock, Strip Stock (cut or extruded), Inserted, Impregnated, or Combination Stock (cork, asbestos, cloth, wire, etc.); (2) Cellular Rubber—Non-interconnecting Cells (hard and soft rubber), Interconnecting Cells (foamed latex, chemically blown or expanded); (3) Gloves; (4) Footwear (boots, overshoes); (5) Bearings and Bearing Strips; (6) Matting; (7) Deck Covering; (8) Hard Rubber Articles (battery jars, ventilation ducts, valves, etc.); (9) Shock, Vibration, and Sound Attenuation Mounts; (10) Cable; (11) Shaft Covering; (12) Sea Chest Coatings; (13) Coverings for Rudders, Struts, and Similar Underwater Surfaces; (14) Submarine Battery Compartment Linings; (15) Pipe Linings; (16) Tires; (17) Goggles, Masks, and Similar Safety Equipment; (18) Life Belts, Life Boats, etc.; (19) Self-Sealing Tanks; (20) Rubber Tubing; (21) Rubber and/or Plastic Coated and Impregnated Fabrics; (22) Miscellaneous Molded Items (crutch tips, chair tips, and other small articles).

Wherever the size and weight of the rubber items permits, representative samples will be collected from manufacturers by Navy Inspectors, who will forward them to the New York Naval Shipyard for photographing. In the case of objects which because of size, value, or other reasons cannot be collected and forwarded, arrangements may be made to have the articles photographed at the place of manufacture. Samples and/or photographs will then be submitted to the Bureau for final evaluation, classification, and typing.

The final classification of defects as to importance and acceptability will be made by committees representing industry, the Bureau, and the Naval Inspectors' Offices concerned. To this end, samples when collected should be clearly identified as to type and cause of defect, and whenever possible further identified by the number of the specification under which procured.

When all photographs have been satisfactorily classified and compiled, visual inspection guides will be prepared from this material and distributed to all interested parties.

Leonard with Binney & Smith

M. H. Leonard

As briefly announced last month, M. H. Leonard has been appointed technical service representative in the Akron office of the Binney & Smith Co. Mr. Leonard received his B.S. degree in chemical engineering from Northeastern University and joined the Firestone Tire & Rubber Co. after graduation. In 1947 he was appointed chief chemist in the Firestone plant at Buenos Aires. Mr. Leonard is a member of the Akron Rubber Group, the American Chemical Society, the American Institute of Chemical Engineers, and is also a licensed professional engineer in the state of Ohio.

U. S. PONDERS ESTABLISHMENT OF SYNTHETIC RUBBER POLICY

The White House took two major steps recently toward determining the nation's future synthetic rubber policy. It announced the formal establishment of an Inter-agency Working Committee on Synthetic Rubber Legislation, with Robert C. Turner of the White House Staff as acting chairman. The committee will prepare for the president's consideration draft recommendations on legislation for the disposal of the nation's synthetic rubber industry. The White House also disclosed that the committee is seeking industry's counsel through a detailed questionnaire recently sent to some 800 members of the rubber, chemical and petroleum industries in this country.

Information sought in the questionnaire included such matters as: What is the real outlook for consumption of synthetic rubber? What kind of protection would buyers of the Government plants want to assure that synthetic could stand up against low price competition from natural rubber? Would the Government still have to require a minimum consumption of the synthetic product, whether users wanted it or not?

Other than Mr. Turner, committee members include: Arthur Wolf (National Security Resources Board), Donald Kennedy (State Department), Frederick D. Bates, Jr. (National Military Establishment), John C. Stedman (Justice Department), Earl W. Glenn (Commerce Department), Charles Stewart (Labor Department).

Also, G. H. Gilbertson (Agriculture Department), Carroll Fentress (Interior Department), Wilbert G. Fritz (Budget Bureau) Paul T. Homan (Council of Economic Advisors), Gerald Hadlock (Reconstruction Finance Corp.), Irving Gumbel (General Services Agency) and Corwin D. Edwards (Federal Trade Commission).

Ruff-Ridge Conveyor Belt

A new type of conveyor belt, molded with a corrugated surface that will raise light goods in cartons or heavy materials in bags up inclines of 30 to 40 degrees, has been announced by the Belting Division of the Russell Manufacturing Co., Middletown, Conn. The new belt, called Ruff-Ridge, consists of a solid woven carcass, thoroughly impregnated with a neoprene solvent cement for moisture resistance. This carcass is then coated on the upper side with a layer of neoprene-natural rubber blend one-eighth to three-sixteenths of an inch thick. Cured against a mold of novel design, the top surface of the belt is given its corrugations, approximately three thirty-seconds of an inch deep on five-sixteenth inch centers. The belt's abrasion resistance is claimed to be comparable to that of a good quality tire tread. The individual corrugations are designed in shape and strength for maximum traction. Made in 250 foot rolls, the belt is available in several thicknesses and in standard widths up to 24 inches.

NAMES IN THE NEWS

JOE DRUSBACK, formerly employed in the sales department of the Fremont Rubber Co., Fremont, Ohio, has been named purchasing agent for the company succeeding IRVING CUTTING, who recently resigned.

KENNETH K. STOWELL, associated with the *Architectural Record* since 1942 as editor-in-chief, has been appointed vice-president in charge of Eastern operations of Giffels & Vallet, Inc., and L. Rosetti, Detroit, Mich., with headquarters in New York City.

E. M. BURGER, who recently completed a training course in foreign operations at the Goodyear Tire & Rubber Co. plant in Akron, Ohio, has been assigned to the company's Mexico City plant as manager of mechanical goods development and technical service.

H. R. SCHMIDT has been appointed sales manager of industrial sales for the M. Werk Co., Cincinnati 17, Ohio.

W. D. BRADSHAW, associated with the Technical Division of the Mechanical Goods Department in the Wolverhampton, England, plant of the Goodyear Tire & Rubber Co., has returned to England after completing a special six-months' special training course in the company's mechanical goods plants in the United States.

SPENCER W. PITTS, assistant to the president of the J. M. Huber Corp., New York, N. Y., has been elected secretary of the company. He will also continue with his present duties as assistant to the president.

ROBERT E. HATHAWAY, formerly associated with the Chemical Division of the General Electric Co., has been appointed New England sales representative for C. K. Williams & Co., East St. Louis, Ill. He will assist ELMER H. KROEPEL.

JOSEPH W. SMITH, previously associated with Brunswick-Balke-Collender Co., has joined the sales staff of the Kraft Chemical Co., Chicago.

JOE COPPS has been appointed sales agent for the State of Wisconsin for the Ferro Chemical Corp., Bedford, Ohio. He will maintain headquarters in Milwaukee.

ALAN E. AUNE, formerly manager of aircraft and automotive wire sales for the U. S. Rubber Co., has joined the Burndy Engineering Co., Inc., to direct national sales activities of electrical products for the automotive trade.

R. C. CHILTON, previously associated with the Industrial Adhesives Division of the U. S. Rubber Co., has been appointed sales manager of industrial and automotive adhesives for Permaplastic Products, Ferndale 20, Mich.

MORRIS S. ROSENTHAL, president of Stein, Hall & Co., Inc., New York 17, N. Y., has been awarded the decoration of "Officier du Merite Commercial" by the French Chamber of Commerce in the United States in recognition of his services in behalf of international trade.

H. H. "HOBE" TODD, associated with the Hamilton Rubber Manufacturing Corp., Trenton, N. J., for the past 30 years in charge of sales in the midwest, has been elected a vice-president of the company.

WARREN INGERSOL has been named assistant to the president of the Lee Rubber & Tire Corp., Conshohocken, Penna., with headquarters at the Republic Rubber Division of the corporation at 22nd and Race Streets, Philadelphia, Penna.

VANCE S. FIRESTONE, associated with the Pharis Tire & Rubber Co., Newark, Ohio, for 12 years as plant engineer, has been appointed to a similar position with the Pittsburgh Plate Glass Co., Ford City, Penna.

PAUL B. WITHSTANDLEY, formerly associated with the Bristol-Myers Co., New York, N. Y., in public relations and promotional work, has been named advertising manager for the Cameron Machine Co., Brooklyn, N. Y.

DR. CHESTER L. ARNOLD, previously director of research for the Western Division of the Stauffer Chemical Co., has been named director of research for the company with headquarters in Richmond, California.

C. W. CAMPBELL, formerly with the Firestone International Co. at Akron, has been transferred to Viskafors, Sweden, as plant manager of the Skandinaviska Gummi A-B, Swedish affiliate of the Firestone Tire & Rubber Co.

PIETER HONIG, formerly head of the Indonesian Rubber Research Institute at Buitenzorg, Java, is now a resident of the United States and at present is associated with the West Indies Sugar Corporation in New York City.

REED WILLIAMS, associated with the B. F. Goodrich Co. for the past 23 years, most recently as chief engineer of the Cadillac, Mich., plant, has been appointed works manager of the Johnson Rubber Co., Middlefield, Ohio.

L. M. BOULWARE, formerly assistant manager of the Fisk Cord Mills, New Bedford, Mass., division of the U. S. Rubber Co., has been appointed manager succeeding F. L. BURNS, who has retired.

Sandran Vinyl Floor Covering

An entirely new kind of smooth surface floor covering was recently introduced by the Sandura Co., Inc., Architects Building, Philadelphia 3, Penna. Called Sandran, the floor covering is made of a blend of vinyl plastic and rubber latex and any design can be reproduced by means of an exclusive new photogravure process developed by the company. The first design, for example, is a re-creation of rubber tile, the photogravure process enabling the company to reproduce the cross-directional marbleization effect. Controlled resilience to make the floor covering comfortable underfoot is obtained by the use of an asphalt and latex-impregnated base material and a specially formulated latex laminant. Sandran is said to be abrasion and wear resistant and to retain its gloss through repeated washings since it is impervious to household acids and alkalis.

New Columbia Chemical Plant

A chlorinated benzene producing plant was recently placed in operation in Natrium, W. Va., by the Columbia Chemical Division of the Pittsburgh Plate Glass Co. Under construction for more than a year, the plant adjourns a large chlorine and caustic soda producing unit constructed during the early war years. Estimated cost of the new plant is more than $1,000,000. The new plant will produce monochlorobenzene, muriatic acid, paradichlorobenzene and orthodichlorobenzene as co-products in a continuous chemical process. Production of the chlorinated benzenes, basic chemicals in the organic field, marks Columbia Chemical's entry into the field of organic chemical compound production.

Double-Seal Insulation

Edwards Industries, 4268 Shenandoah Ave., St. Louis 10, Mo., has begun distribution on a door insulation which is said to feature two seals in one. Called Double-Seal, it is a curved rubber strip in lengths up to 12 feet which can be cut into desired length for specific purposes. The crest of the curve is attached to the bottom of the door with a stainless steel bar that is noncorrosive and does not oxidize. When the door closes, one edge forms a seal to the floor on the outside sill and the other edge seals itself to the floor on the inside. The unit is made of a natural rubber compound, especially designed to give good service at low temperatures.

British Producing Carbon Black

According to reports from London, the first bulk production of carbon black has begun in South Wales using British raw materials. This has been accomplished by United Carbon Black, Ltd., which has erected and installed a carbon black unit at its works at Swansea. The plant covers approximately seven acres, and the black is being produced by a furnace process. Sales agents for the new black include Hubron Rubber Chemicals, Ltd., at Manchester, and Wilfrid Smith, Ltd., in London.

Lathrop Named Cameron Head

Palmer J. Lathrop

Palmer J. Lathrop, actively associated with the Cameron Machine Co., Brooklyn, N. Y., since September, 1948, and a member of the board for many years, has been elected president of the company succeeding the late Harold Kinsey. Mr. Lathrop was formerly associated with the Bristol-Myers Co. as vice-president in charge of production. He is a graduate of Princeton University, and served in the Air Corps during World War II with the rank of major.

Rosin Amine D Available

Hercules Powder Co., Wilmington, Delaware, has announced that Rosin Amine D, a primary amine of high molecular weight, derived from a special modified rosin, is now available in commercial quantities. The material is compatible with natural rubber, GR-S, nitrile rubbers, polyvinyl chloride, ethyl cellulose, and other materials, but is incompatible with cellulose acetate and polyvinal acetate. Rosin Amine D and certain of its salts are reported to have shown promise as softeners and reclaiming agents for both natural and synthetic rubber. In combination with other accelerators, they have shown powerful accelerating action during curing. Also, the salts have shown promise as emulsifiers in acid emulsion polymerization systems. Addition of this amine to certain latices was found to improve adhesion of rubber to tire cord.

Article on Automatic Control

An interesting article on automatic controls for processing Firestone Velon appears in the Summer, 1949, issue of *Taylor Technology*, house organ of the Taylor Instrument Companies, Rochester 1, N. Y. The article is entitled "Instrumentation Responsible for Higher Production and Quality in the Manufacture of Firestone Velon" and contains several schematic diagrams of the installation. Copies of the issue may be secured direct by writing to Charles W. Covey, Taylor Instrument Companies, Rochester 1, N. Y.

Goodrich Oxy-Acetylene Hose

A twin oxy-acetylene hose in which two lengths, one red and the other green, are joined by a thin strip of rubber, has been announced by the B. F. Goodrich Co., Akron, Ohio. The hose will be marketed under the name Duo-Weld. The new product employs the same compounds utilized in the company's single oxy-acetylene hose. Reinforcement consists of one braid of high tensile hawser cord cotton yarn in ¼-inch size which is said to give strength comparable to the standard two-braid single line construction. The rubber strip joining the two hose lengths is of high quality rubber stock with extreme flexibility. The strip also allows the hose to be separated into single lengths, when that is desirable, without tearing into the cover of either length. The hose is being made in 50, 25 and 12½-foot lengths, with the ¼-inch size being stocked. Each length is separated approximately 18 inches from each end and secured with a metal ferrule at the separation point.

B. F. Goodrich Cited by FTC

The Government recently charged the B. F. Goodrich Co., Akron, Ohio, with unlawful price discrimination in the sale of rubber and canvas footwear. A complaint filed by the Federal Trade Commission on July 25 in Washington, D. C., alleged that the practice was carried out through the company's subsidiary, the Hood Rubber Co., Watertown, Mass. In launching the action, the FTC dismissed a similar complaint against Hood on the grounds that it was a wholly-owned Goodrich subsidiary. FTC specifically charged that Goodrich violated the provisions of the Robinson-Patman Fair Trade Act by selling footwear to some customers "at higher prices than it sells such products of like grade and quality to other of its customers." The commission gave Goodrich 20 days in which to answer the complaint, after which hearings will be held.

Shipping Pepton 22 Dispersions

Calco Chemical Division of the American Cyanamid Co. has announced that shipments of Pepton 22 Dispersions are now available in Singapore through the company's sales agents, Messrs. East Asiatic Co., Ltd. These dispersions are incorporated in the latex prior to coagulation and are said to provide an improved ribbed smoked sheet. Among producers who are expected to have such smoked sheets available for shipment from the East within the next few months are Harrisons and Crosfield and the East Asiatic Rubber Estates, both well-known rubber producers.

A new two-page illustrated bulletin, describing the applications of SR-4 Load Beams, such as for process and machine control, and for general force measurement, has been issued by the Testing Equipment Department, Baldwin Locomotive Works, Philadelphia 42, Penna.

Minnig Named Sales Manager

Max A. Minnig

Robert I. Wishnick, president of the Witco Chemical Co., and Carl J. Minnig, vice-president and director of sales of the Carbon Black Division of Witco Chemical Co., have announced the appointment of Max A. Minnig as sales manager of the Carbon Black Division. Mr. Minnig will be located in Akron, Ohio, at 311 Evans Building, and will continue his connection with Witco Carbon Co. as vice-president and director.

Dayton Rubber Koolfoam Pillow

Dayton Rubber Co., Dayton, Ohio, has announced its entrance into the rapidly growing foam rubber market with the introduction of a new type pillow under the trade name "Koolfoam." The pillow is manufactured under a patented process, company officials stated, that develops an increased and more uniform number of interconnecting air cells. This, in turn, provides an improved ventilating or cooling action in the pillow as well as maximum softness, resilience and tear resistance. Because the material is allergy free, it offers relief to hayfever and asthma sufferers. The Koolfoam pillow measures 16 x 24 x 5½ inches, and is offered in pastel shades of pink and blue, as well as white. They are covered with a matching 80-square percale with full 18-inch zipper for easy washing.

Magnesia in Polyethylene Bags

J. T. Baker Chemical Co., Phillipsburg, N. J., has announced the availability of magnesium oxide, neoprene grade, in polyethylene 5-pound bags packed 10 to the carton. These bags are said to give added protection to the most sensitive ingredient used in compounding neoprene: magnesium oxide (calcined magnesia). Baker claims that temperature control, uniformity of product, and packaging to prevent moisture infiltration are three of the important factors which assure calcined magnesia that is trouble-free for neoprene compounding.

FINANCIAL NEWS

Hewitt-Robins, Inc.

First Half: Net income of $246,003, which is equal to 88 cents per share on 278,714 shares of capital stock outstanding, compared with $234,718, or 84 cents a share, for the first six months of 1948. For the three months ended June 30, 1949, net earnings were $26,197. President Thomas Robins, Jr., declared that the second quarter earnings "reflect a sharp decline in the sales of the company's mechanical rubber goods and a lesser decline in the company's Conveyors Division." Sales in the second quarter of 1949 amounted to $4,637,395, as compared with $5,333,619 in the quarter ending March 31, 1949, and $5,692,719 in the second quarter of 1948.

U. S. Rubber Co.

First Half: Net income of $6,655,010, which is equal to $2.30 per common share, and which compares with a net income of $10,889,643, or $4.70, for the corresponding period last year. Net sales for the first half of 1949 were $258,302,914, compared with $278,120,805 for the first half of 1948. Net Income for the first quarter of 1949 was $3,375,069, after all charges, equal to $1.18 a share, against $4,601,164, or $1.87 a share, in the same period the year before.

DeVilbiss Company

First Half: Net income of $211,743, which is equal to 70 cents a share, compared with $327,025, or $1.09 a share, for the corresponding period of last year. For the quarter ended June 30, 1949, net income was $114,905, which is equal to 38 cents a share, against $190,246, or 64 cents a share, the year before.

Plymouth Rubber Co.

Six Months to May 31: Net income of $108,813, or 12 cents each on 900,000 shares, compared with $155,981, or 17 cents a share, for the corresponding period last year. For the entire fiscal year ended November 30, 1948, net profit amounted to $159,167.

Rome Cable Corporation

June Quarter: Operating profit of $13,530 before $150,000 charge on account of copper loss which was transferred from contingency reserve, which compares with a net profit of $230,598, equal to 55c a share, for the corresponding period of the previous year.

Pantasote Company

First Quarter: Net loss of $10,138, compared with a loss of $74,759 last year.

American Cyanamid Co.

First Half: Net income of $7,212,245, which is equal to $2.63 a share on 2,737,686 common shares outstanding, compared with $6,851,236, or $2.50 a common share, in the first half of 1948. The net income is computed on a basis including equity in undistributed earnings of associated companies 49 or 50% owned. Net sales for the period ended June 30, 1949, totaled $113,659,005, against $114,208,871 in the corresponding period of 1948.

Dewey & Almy Chemical Co.

First Half: Net income of $203,789, which is equal to 64 cents a share, against $322,258, or $1.01 a share, for the corresponding period last year. Net sales for the first half of 1949 amounted to $7,602,191, compared with $7,916,972 for the first half of 1948.

National Erie Corporation

For 1948: Net income of $490,890, which is equal to $2.20 a common share, compared with the 1947 net of $391,241, or $1.74 a share.

Offer Engineering Data Sheet

An engineering data sheet describing the complete line of improved types of North-Erie mixing and blending equipment has been made available by the H. W. North Co., 1213 Parade St., Erie, Penna. Tables listing the wide range of sizes and capacities of the various units are included. Data is furnished on standard duty horizontal sigma blade type mixing and kneading machines; horizontal single blade multiple ribbon mixing and blending machines; conical dry rotary mixing, blending and tumbling machines; heavy duty internal dispersion type mixers, and special duty intensive mixers or masticators.

Dispose of Pharis Plant

Plant No. 3 of the Pharis Tire & Rubber Co. at Newark, Ohio, has been purchased by the Prudential Insurance Co. of America for an undisclosed sum. The plant, built by the Defense Plant Corp. during the war, was valued at about $1,000,000, and contained 123,000 square feet of floor space. Prudential, in turn, has leased the plant to the Westinghouse Electric Co. for use as a warehouse.

All-Weather Bicycle Tire

A new size bicycle tire designed to meet fast-growing demand from the nation's juvenile wheel riders has been added to the cycle tire line manufactured by the Goodyear Tire & Rubber Co. The tire is the 20 x 2.125 DeLuxe All-Weather, previously built by the firm in 24 and 26-inch sizes.

New Golden Bear Materials

The Chemicals Division of the Golden Bear Oil Co., Los Angeles, Calif., has added Califlux TT, G. B. Naphthenic Neutrals, and G. B. Asphaltenes to its line of petroleum-base chemicals for the rubber and allied industries. Califlux TT is particularly recommended by the company for use with the new low temperature polymers. It is a mixture of naphthenic hydrocarbons, 100% distillable, reddish-brown in color, has a specific gravity of 1.01 to 1.03, has good storage stability, and is soluble in most organic solvents. In comparison with other Califlux products, Califlux TT is similar in composition to Califlux R-100, although it is of somewhat lower average molecular weight and has less activating effect on cure. The G. B. Naphthenic Neutrals are mixtures of saturated and unsaturated naphthenic hydrocarbons and are less miscible with rubbers than are the products of the Califlux series. They function as internal lubricants in rubber compounds, facilitate cool processing and produce stocks which are easily extruded, and due to their blooming effect they serve also as mold release agents. The G. B. Asphaltenes are concentrates of asphaltenes in such form as to insure best dispersion in rubbers at ordinary milling temperatures. They are especially recommended by the company for GR-S compounds in which good physical properties may be obtained without the use of channel black or with only moderate loadings.

Pennsylvania Tires in Production

A large portion of the big task of integrating the tire and tube production of the Pennsylvania Rubber Co. into regular production lines at the plant of the Mansfield Tire & Rubber Co. in Mansfield, Ohio, has been completed. Manufacturing operations are being maintained at the Pennsylvania Rubber plant in Jeannette, Penna., and will continue so until all of the plant's tire and tube production is integrated into the regular daily schedules at the Mansfield plant. Present plans call for establishing Pennsylvania Rubber's sales, advertising and other allied personnel in offices at Plant 3 in Mansfield, adjacent to the main plant. Pennsylvania Rubber will continue to manufacture its nationally-known line of athletic goods at the Jeannette plant.

Durethene Polyethylene Film

Durethene Corp., 55th Ave. at 19th St., Chicago 50, Ill., is now offering polyethylene flat film in thicknesses from .0015-inch to .060-inch in widths up to 60 inches, and tubular film in both flat and gusseted in widths up to 54 inches and in wall thicknesses of .0015-inch and up. Polyethylene films made by Durethene are quality controlled with electronic gauging equipment that continuously measures the thickness of the film as it is produced. Tear strength tests are likewise made on a sample taken from each roll, insuring a superior film. Natural as well as all standard colors are available. Standard embossed surface patterns as well as designs to customer specifications are also available.

Named Rubber Section Head

Clifford L. Ayres

Flintkote Co., New York 20, N. Y., has announced the appointment of Clifford L. Ayers as rubber products manager to head the Rubber Section of the Industrial Products Division. Mr. Ayers graduated from Western Reserve University of Cleveland, Ohio, with a B.A. degree in Chemistry, followed by a year's graduate work in chemical engineering at Ohio State University. Prior to joining Flintkote in 1946, Mr. Ayers was associated for eight years with the Goodyear Tire & Rubber Co. in Akron, Ohio. With Goodyear, he was primarily engaged in chemical research on resins and paints; in Development Department activities as a compounder; and in work on ordnance materials. He is a member of the New York, Philadelphia and Connecticut Rubber Groups, the American Chemical Society and the American Association for the Advancement of Science. Mr. Ayres succeeds D. C. Cochran, who recently resigned from the company.

Changes Announced by Enjay Co.

Changes of sales personnel and offices to improve service to customers and prospects under today's conditions have been announced by I. E. Lightbown, manager of Rubbers and Plastic Sales of the Enjay Company, Inc. E. N. Cunningham, who has been supervising the sale of Paracril Buna N-type rubber, has been placed in charge of the Metropolitan territory for all rubbers and plastics, which include Paracril, Vistanex polyisobutylene, S-Polymer thermoplastic resin, and Deenax antioxidant. He replaced R. M. Howlett who moves to the Midwest territory with headquarters in Chicago. An Enjay Rubbers and Plastics sales office has been opened at Room 706, Albender Building, 1143 East Jersey Street, Elizabeth 4, New Jersey. Mr. Cunningham will make his headquarters at this location, as will also H. C. Evans, who is in charge of the Eastern territory.

New Type Goodrich Spray Hose

A new spray hose, designed to utilize working pressures as high as 800 pounds per square inch, made in long lengths and designed to handle many sprays of the type which previously were destructive to rubber hose, has been announced by the B. F. Goodrich Co., Akron, Ohio. The company says that the new hose has greater strength and less friction loss because of the extremely smooth tube employed than any present product of this type. Compounds of oil-resistant rubber make the new hose highly satisfactory for use with all types of horticultural sprays, such as DDT, 2-4D and weed killers with highly aromatic carriers. It can also be employed on hydraulic equipment, in car washing units and for carrying materials used in undercoating automobiles. Braided construction with a new type high tensile cotton yarn makes possible the use of only two braids in all sizes except the ¾-inch, which is made in three braids. The ⅜ size has 13/16 outside diameter, 7/16 has ⅞, ½ has 31/32 and ¾ has 1-5/16. The cover is black with a lead press molded finish.

Dayton Rubber Cog-Belt

The Dayton Cog-Belt, successor to the belt first introduced by the Dayton Rubber Co., Dayton, Ohio, in 1921, now is being offered with a 40% increased horsepower rating. The 40% horsepower increase enables these belts to be used for special application or under certain conditions where space is limited. The company claims that because of their bias cut fabric, flexibility and preformed cog construction, these belts flow easily and naturally around pulleys of substandard diameters, while providing an undistorted maximum contact arc. This permits the use of up to 25% smaller pulley diameters with an equivalent reduction in center distances. In addition, the use of smaller pulleys can mean savings in weight of as much as 1,000 pounds. Over small diameters, says the company, this new belt has been known to give 5 to 6 times the life of a normal belt.

U.R.W.A. Votes $1,000,000 Fund

Creation of a $1,000,000 fund to back the union's campaigns for wage increases and pensions was voted recently by the general executive board of the United Rubber, Cork, Linoleum and Plastic Workers of America, CIO, meeting in Akron, Ohio. The fund, to be known as a special "Economic Defense Fund," will be made up of voluntary contributions from the members. The board asked the union's 180,000 members "to donate at least one dollar per week" until the wage pension plan is won. Full-time officers and staff members of the union were urged to give five dollars a week to the fund. The voluntary fund drive is necessary, said the board, because "the strike and defense fund of the International Union is not strong enough to provide material aid to our members . . . if they are forced to go on strike."

Wallace Joins Goodyear Chemical

Roy Wallace

Roy Wallace, associated with the Goodyear Tire & Rubber Co. since June, 1948, has been named to a technical service post in the Chemical Division of the company. Mr. Wallace, a graduate of Ohio State University with a degree in chemical engineering, will supervise test installations and applications of Goodyear chemical products, and will assist in the preparation of technical literature. A native of Grafton, W. Va., Mr. Wallace completed his scholastic training at Ohio State following his discharge from the U. S. Air Corps in 1945. He joined the Goodyear organization in June, 1948, and after specialized training in paint formulation, rubber compounding, and rubber and resinous latices, was assigned to the Chemical Division.

Rubber Consumption Declines

According to the Rubber Manufacturers Association, total natural and synthetic rubber consumed in the United States during the first six months of 1949 totaled 509,994 long tons, a drop of 6.88% from the 547,673 tons reported for the first six months of 1948. Of the 1949 figures, 218,938 tons were synthetic, and 291,056 were natural, compared with the 1948 figures of 225,704 and 321,969 tons, respectively. Reclaimed rubber consumed during the first six months of 1949 totaled 112,295 tons, a decline of 20.19% from the 140,704 long tons consumed in the first half of 1948.

Creepas Sponge Soled Socks

P. A. Donahue, 403 East 23d St., Los Angeles 11, Calif., has introduced a novel item of footwear, Creepas, socks finished with neoprene sponge soles. The soles, cemented to colored wool, cotton or nylon tops, resist abrasion and are not affected by hot water or washing soaps. Creepas are designed for house wear, spectator sports or traveling.

CANADIAN NEWS

Gross value of products turned out by the rubber industry of Canada in 1947 rose to an all-time high of $196,308,000 as compared with $159,408,000 in the preceding year, and compares with the previous record figure of $181,413,000 in 1945.

Sixty plants were in operation in 1947, furnishing employment to 23,475 persons who received $46,614,000 in salaries and wages, as compared with 22,055 employes earning $37,813,000 in 1946. Ontario employed almost 72 per cent of the persons engaged in the industry and produced over 82 per cent of the entire output, while 28 per cent of total employment and 17 per cent of production was in Quebec.

Domestic rubber consumption increased slightly in May to 13,217,000 pounds, compared with 13,054,000 the previous month, the Dominion Bureau of Statistics has reported.

Natural rubber consumption rose to 7,154,000 pounds from 6,888,000, reclaim to 2,304,000 from 2,218,000, and synthetic dropped to 3,760,000 from 3,948,000 pounds. Less rubber was used in tires and tubes but more in rubber footwear.

May production of synthetic rubber totalled 10,176,000 pounds compared with 7,652,000 while reclaim production advanced to 692,000 from 569,000.

Net profit of the Viceroy Manufacturing Co. for the year ended February 28, is reported at $146,235, equal to approximately $1.24 per share, against $132,368 or $1.12 per share the year before. Operating profit increased to $246,596 from $201,621. Reflecting the amount of $112,761 arising from sale of the roofing division as well as improved operations, earned surplus, after dividends of $60,278, stood at $751,120, up from $552,403 a year ago.

Sale of the roofing division, it is stated, will permit full concentration on the rubber and engineering divisions of the company. Substantial improvement occurred in financial position, with net working capital February 28, 1949, of $909,860, comparing with $722,447 at the previous year-end.

The Canadian Government reports that consumption of rubber of all kinds in the footwear industry of Canada, including heels, soles, etc., decreased to a total of 1,238,806 pounds during April this year, comprising 754,799 pounds of natural, 326,575 pounds of synthetic, and 157,432 pounds of reclaim, as compared with a total of 1,524,313 pounds during March, including 958,832 pounds of natural, 335,457 pounds of synthetic and 230,024 pounds of reclaim.

Meredith, Simmons & Co., Ltd., of Lachine, Montreal, has changed its name to National Adhesives (Canada), Ltd. The company, which manufactures rubber-base adhesives among other types, is an affiliate of National Starch Products, Inc., of New York. Ernest Hofmann is vice-president and general manager of the Canadian concern.

Frank Sherman, of Hamilton, and C. A. Massey, of Toronto, have been appointed to the board of directors of the Polymer Corporation, succeeding H. J. Carmichael and L. C. McCloskey, who retired after serving for three years each.

Identify Guayule Intermediate

Identification of a substance which is probably an intermediate out of which the guayule plant builds its "big molecules" of natural rubber has been made with the aid of radio-active carbon, it is reported. The intermediate quantities is though to exist in the plant only in minute quantities apparently because the plant uses it as soon as it is formed to build up the more complex rubber molecules—for storage in the bark of its steam and roots.

Under controlled feeding tests, scientists fed guayule plants solutions of nutrients that encouraged good growth but little or no rubber formation. Then they tested for precursors of rubber by adding other chemicals that might contribute to formation of rubber. Using radiocarbon and tracer technique, the scientists identified beta-methylcrotonic acid in the guayule plant. This acid reportedly can couple its molecules together to form some of the compounds of smaller molecular size in the chain of products having the same basic formula as the big molecules of rubber.

Test evidence indicates that guayule is able to cause this bending or coupling of molecules in creating its rubber. This discovery appears to be an important step toward duplicating in a factory the synthesis of natural rubber.

Offers Services in Germany

Otto Hagmann, 5 Alderstrasse, Karlsruhe, Germany (U. S. Zone 17-A), associated before the recent war with I. G. Farbenindustrie as a commercial traveller, is interested in hearing from American concerns who may wish representation in Germany or other European countries. At present, Mr. Hagmann is an interpreter with the American Occupation Forces in Karlsruhe.

Acquires Burrill Saw Works

Acquisition of the Burrill Saw and Tool Works of Ilion, N. Y., has been announced by the L. S. Starrett Co. of Athol, Mass. Paramount band knives and band saws, several types of which are used for cutting rubber and sponge rubber, are now being manufactured exclusively by the Starrett company in its Athol plant.

CONSUMPTION OF RUBBER DROPS 6.7% IN FIRST HALF OF 1949

According to preliminary statistics issued by the Department of Commerce, new rubber consumption for the first six months of this year totaled 509,075 tons, a decline of 6.7% from the 545,524 tons for the corresponding period of 1948. Consumption of new rubber totaled 83,664 long tons in June, an increase of 2.8% over the 81,395 tons reported for May but a decrease of 11.5% from the 94,543 tons reported in June, 1948.

Consumption of natural rubber in June totaled 46,739 tons compared with 46,128 tons in May and 56,046 tons in June, 1948. Natural latex usage, included in these figures, increased to 2,908 tons in June from 2,757 tons in May and exceeded the June, 1948, figure by 362 tons. Synthetic rubber consumption amounted to 36,925 tons in June compared with 35,267 tons in May and 38,497 tons in June, 1948. The June, 1949, total included 28,863 tons of GR-S, 4,992 tons of butyl, 2,591 tons of neoprene, and 479 tons of nitrile rubbers.

The ratio of natural rubber consumption to total natural plus GR-S declined to the lowest point since October, 1947, and amounted to 61.8% in June compared with 62.5% in May, and 65% in June, 1948. The decline in the ratio this year does not indicate voluntary increases in the use of GR-S.

More Natural Consumed

In the manufacture of non-transport, where use of GR-S is wholly voluntary, proportionate use of natural has been running higher than last year. The explanation lies in the current production pattern, the Commerce Department reported. Output of passenger tires and camelback, which use much of the GR-S, has been running relatively high, while output of truck and bus tires, which use mostly natural rubber, has been declining.

Production of synthetic rubbers in June was 4,972 tons lower than consumption, resulting in lower month-end stocks. June production of 31,953 tons consisted of 25,120 tons of GR-S, 3,615 tons of butyl, 2,310 tons of neoprene, and 908 tons of N-Type. Total output in May was 32,335 tons, and in June, 1948, 41,023 tons.

Reclaim Rubber Output

Reclaimed rubber output was reported at 18,833 tons in June and consumption at 19,355 tons. Stocks were reported at 30,828 tons at the end of June, down 1,498 tons from May. The ratio of reclaim consumption to total new rubber consumption increased to 23.1% in June, the highest percentage so far this year. In June, 1948, it was 24%.

Reported stocks of new rubber available to industry at the end of June were (in long tons): Natural, 103,444 (including 8,177 tons of latex); GR-S, 89,371; butyl, 10,964; neoprene, 3,463; and N-Type, 3,092. Comparable stocks at the end of May, in the same order were: 111,875 (8,388), 93,096, 12,204, 4,234, and 3,005. At June rates of consumption, stocks of natural rubber and butyl represent just over 2 months' supply, GR-S 3 months', and neoprene 1-1/3 months'.

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OBITUARIES

William M. Metzler

William M. "Pop" Metzler, consulting superintendent of the Mechanical Goods Division of the Goodyear Tire & Rubber Co., Akron, Ohio, died in Akron on July 23. Mr. Metzler, who was 89 years old, was known as the "dean" of the Akron rubber industry. He had completed 63 full years of service in the rubber industry on February 1, 1949. Born in Akron on September 26, 1860, he was believed to be the oldest man as well as the holder of the record for length of service in the rubber field. In 1892, Mr. Metzler left Akron to join an eastern rubber manufacturing concern, returning in 1894 as assistant superintendent of the old Diamond Rubber Co. Following the merger of the Diamond company with Goodrich in 1912, Mr. Metzler joined Goodyear as superintendent of its new Mechanical Goods Division. Under his supervision, this division rose to a position with the leaders in that field. He is survived by his wife, two sons and two daughters.

James L. Hastings

James Loren Hastings, retired general purchasing agent for the Phelps-Dodge Corp., New York, N. Y., died on July 22 at his home in Glendale, Calif., after an illness of several months. He was 75 years old. Born and reared in Chicago, Ill., Mr. Hastings served as general purchasing agent for the Federal Shipbuilding Corp., a subsidiary of United States Steel, before joining Phelps-Dodge in 1924. For the next ten years he was regional purchasing agent in the company's Douglas, Arizona, branch, transferring to the New York offices in 1934 to become general purchasing agent for the entire organization. After retiring on April 1, 1944, Mr. Hastings moved to Glendale, Calif. He was a member of the Bankers Club of America. His wife survives.

William H. Sheffield

William H. Sheffield, president and general manager of Innis, Speiden & Co., New York 6, N. Y., died of a heart attack on July 25 at his summer home in Allenhurst, N. J. Born August 7, 1874, in Mahwah, N. J., Mr. Sheffield joined the Sheffield Farms Co. in 1895. He was vice-president and director of Sheffield Farms until 1924, when that company joined with National Dairy Products. He became a director of Innis, Speiden & Co. in 1912, and served as president and general manager from 1926 until his death. Services were held on July 28 at his home in Allenhurst, with interment on July 29 at Hobart, N. Y.

Howard M. Rinehart

Howard M. Rinehart, former operator of a rubber plantation in the Amazon Valley and associated with the Rubber Development Corporation during World War II, committed suicide on July 30 in Hattiesburg, Miss., where he had made his home for the past few years. He was 64 years of age and had been in poor health for some time. In his youth, Mr. Rinehart was a telegrapher with a construction company in Brazil. Later, after hearing of the aeronautical exploits of the Wright Brothers he went to Dayton, Ohio, where he joined the aviation pioneers, serving as test pilot. During World War I, Mr. Rinehart was chief test pilot on battle planes and conducted military flying schools. In 1922, he returned to the Amazon and became a rubber plantation owner, doing some gold prospecting on the side. No relatives survive.

Bartholomew J. Chiappinelli

Bartholomew J. Chiappinelli, treasurer of the General Insulated Wire Works, Inc., Providence, R. I., and president and treasurer of S. Chiappinelli Co., Inc., a real estate firm in Providence, as well as foreman of the S. Chiappinelli Jewelry Co., also of Providence, died recently after a brief illness. He was 45 years old. Mr. Chiappinelli was born in Providence on July 28, 1904. Services were conducted in St. Paul's Church with interment in St. Ann's Cemetery in Providence. His wife, two daughters and a son survive.

James M. Davidson

James M. Davidson, superintendent of the Buffalo, N. Y., plant of the Farrel-Birmingham Co., Inc., died suddenly on July 15 at the Millard Fillmore Hospital in Buffalo, after a brief illness. Mr. Davidson began his business career with Farrel-Birmingham in 1920 as an office boy. He climaxed his steady progress with his appointment as plant superintendent in 1946. His wife and daughter survive.

Bert L. McConn

Bert L. McConn, metropolitan New York representative of the Pigment Color Division of the Imperial Paper & Color Corp., Glens Falls, N. Y., died on July 17 of a heart attack while visiting friends in Salem, Ohio. He was 50 years old. Mr. McConn had been associated with the company for the past 17 years.

BUSINESS DIFFICULTIES

The following data on recent business difficulties in the rubber industry was furnished by the Rubber Division of the National Credit Office, Inc., of New York:

MIDLAND RUBBER CO., CEDAR RAPIDS, IOWA—A special meeting of creditors was called on July 7 to propose an extension of obligations amounting to approximately $11,000. It is reported that Lowell D. Smith & Associates sold their stock holdings in the company to others early in July.

MILLCRAFT TILE & RUBBER CO., HOPKINS, MINN.—A receiver was appointed for this company on July 8. Previous financial difficulties of the company have been already reported.

V. R. P. RUBBER CO., INC., BARBERTON, OHIO—A special meeting of creditors was called for August 3. Further details will be announced shortly.

In addition to the above, a petition in bankruptcy was filed in the Southern District of New York on August 1 by the Meyer & Brown Corp., dealers in scrap, crude and other rubbers. The petition listed liabilities of $758,984 and assets of $207,620. The court referee has appointed Charles R. Barrett receiver in the action under a bond of $1,000.

Suggests Holding Alcohol Plants

A recommendation that the government retain for the present three wartime industrial alcohol plants in the midwest was made to a Senate agricultural subcommittee on August 4 by Major General S. P. Spalding, acting director for industrial programs of the Munitions Board. The plants, located at Muscatine, Iowa, Kansas City and Omaha, were originally constructed to furnish alcohol for butadiene in the synthetic rubber program. They are held by the Department of Agriculture, which leased them to private concerns. These concerns have indicated a desire to give up the plants because they are unable under current market conditions to profitably produce industrial alcohol from grains.

Representing Golden Bear Oil

The Chemicals Division of the Golden Bear Oil Co., Los Angeles, Calif., has announced the appointment of C. W. Baldwin as its representative in the middle west, including such points as Denver, Colorado, Natchez, Mississippi and Des Moines. Mr. Baldwin, who is Chicago representative of the United Carbon Co. and other companies, will handle the full line of Califlux petroleum-base products for the rubber industry. Mr. Baldwin makes his headquarters at 135 South LaSalle St., Chicago 3, Ill.

The Burrell Technical Supply Co., of Pittsburgh, Penna. has changed its name to the Burrell Corporation. The change was made to reflect the growing variety of the company's business.

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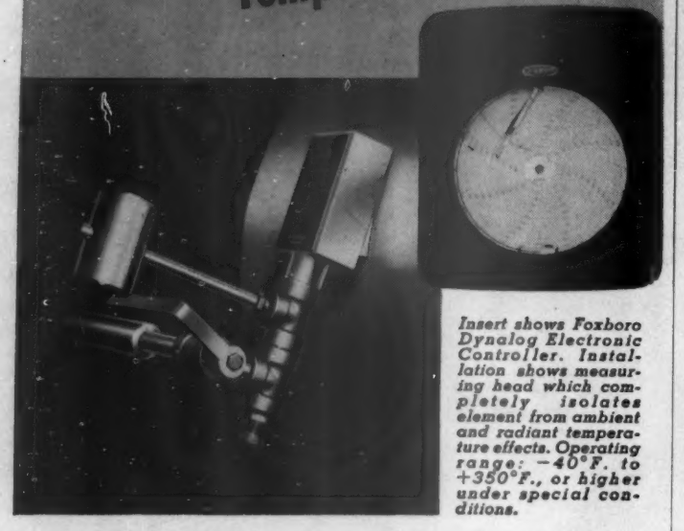

Insert shows Foxboro Dynalog Electronic Controller. Installation shows measuring head which completely isolates element from ambient and radiant temperature effects. Operating range: −40°F. to +350°F., or higher under special conditions.

A UNIQUE, NEW FOXBORO SYSTEM for Calender and Mill Rolls

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FOXBORO Instrumentation

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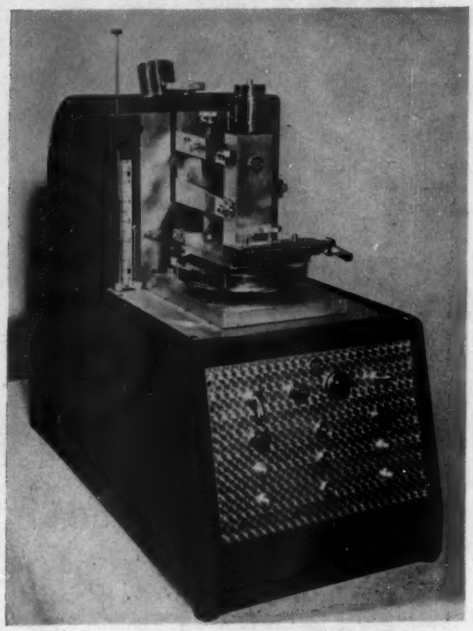
NEW EQUIPMENT

CSI Universal Wear Tester

A unit built to produce the three major actions of fabric abrasion—flat abrasion, edge abrasion and flex abrasion—has been announced by Custom Scientific Instruments, Inc., 541 Devon St., Arlington, N. J. Known as the CSI-Stoll Quartermaster Universal Wear Tester, the instrument is the result of ten years of study and research by Dr. R. G. Stoll of the Philadelphia Quartermaster Depot, Philadelphia, Penna.

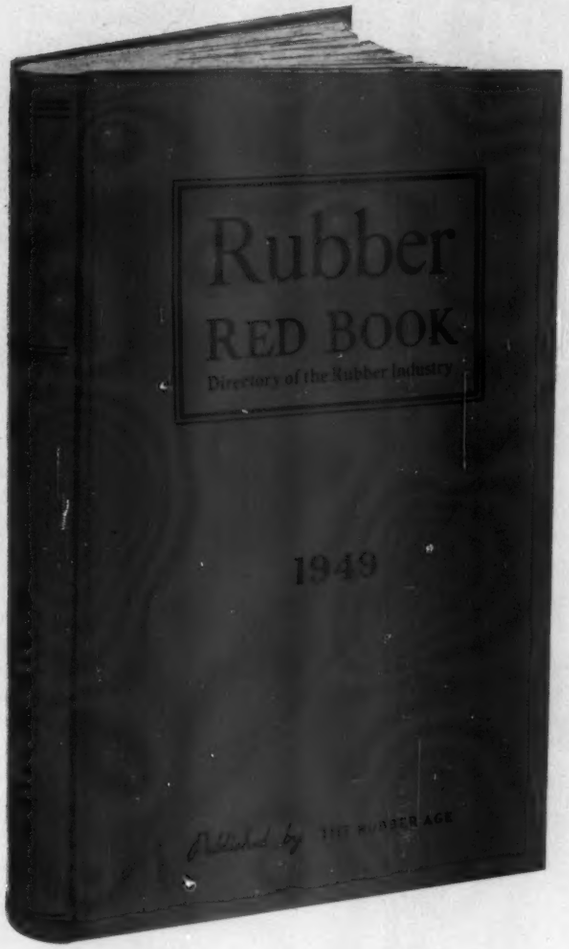


In flat abrasion the machine maintains the sample under controlled tension and pressure throughout the test by means of a pneumatically-operated device. The sample is equally abraded over the entire contact area and from every direction, and by this method insures a constant abrasion even if the sample is not of uniform thickness. The machine also has an electric control which automatically stops the test at a pre-determined point.

For edge abrasion testing, the air control head is removed and replaced by a clamping fixture which holds the fabric in a folded position. The folded edge of the sample is brought into contact with the abradant either in a uni-directional or multi-directional movement with precisely controlled pressure. An electrically-controlled stop is also provided for this type of test.

Flexing is the third test provided for in this machine. For this test a folded specimen strip is placed between the abrasion head and a flat oscillating table. The motion of the machine rolls and unrolls the folded fabric causing a flex abrasion which can be measured in loss of tensile strength after a given number of cycles required to break the specimen. The Universal Wear Tester is also adaptable for the testing of all kinds of coated fabrics and plastics.

Available in September



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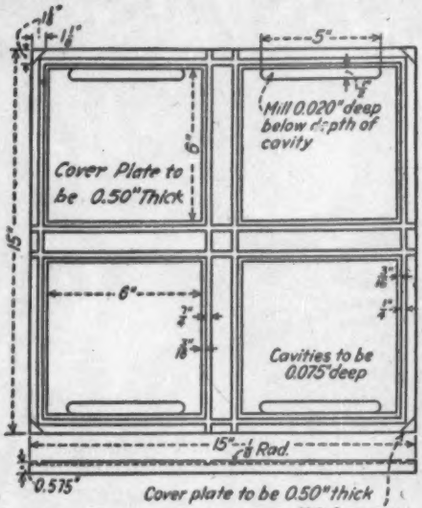
Cover Plate to be 0.50" Thick
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Cambridge Surface Pyrometers are light weight, portable instruments—accurate but rugged—for measuring temperature of mold cavities and flat surfaces, still or moving rolls, and within-the-mass temperature of materials in a plastic or semi-plastic state. Write for Bulletin 194-SA; 33 illustrations, many rubber applications.

CAMBRIDGE INSTRUMENT CO., INC.

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THEY HELP SAVE MONEY AND MAKE BETTER RUBBER

Compounder-Extruder for Thermoplastics

The development of a single machine which compounds, extrudes and/or pelletizes thermoplastic materials in a single pass was recently announced by the Machinery Division of Welding Engineers, Inc., Norristown, Penna. The unit will take in virgin material and plasticize, compound, and color it in one continuous operation. Successful tests are reported to have been

conducted with various vinyls, polystyrene, cellulose acetate, and other materials.

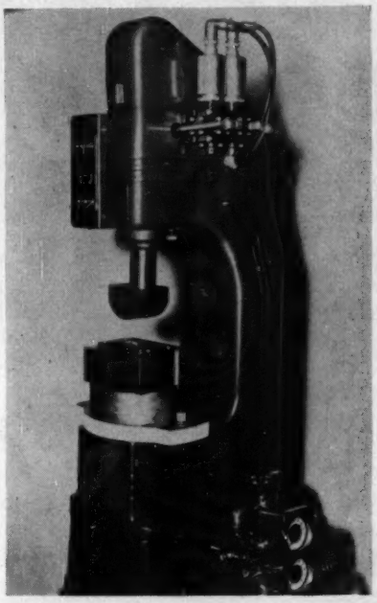
Basically, the unit is an extruder using two worms, and a special worm design makes possible the thorough compounding of thermoplastic materials and assures a high output of pounds per hour. It consists primarily of three distinct sections—the first is the feeding and compounding section, the second is a secondary compounding section, and the third is the extrusion section. The two worms rotate in unison within the chamber of the compounding sections, the walls of which are machined to the shape of a figure eight. The two worms are of different lengths. In the back portion of the machine, that is, from the hopper opening for about one-half way along the barrel, both worms participate in the operation of kneading and compounding and heating the material. After the material has thus been prepared, it moves forward to the portions of the worms which extrude it from the die. Here, the figure eight contour of the compounding chamber streamlines into the conventional single opening of an extrusion chamber, through which the main worm extends.

At the end of the machine, prior to the die, the chamber has external threads machined on it. These threads made with internal threads on a die nut which is used to fasten all types of dies quickly on to the barrel, each die simply having a shoulder of the appropriate size to fit the die nut.

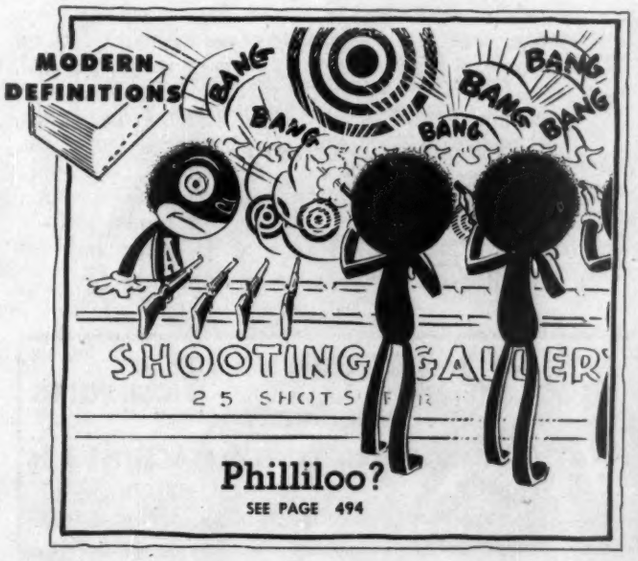
At present, the Compounder-Extruder is obtainable in five sizes. The smallest is the Series 2000 (illustrated herewith), with double 2-inch worms and featuring an average output of 100 pounds per hour. Largest of the models is the Series 6000, with double 6-inch worms, capable of compounding and extruding at an average rate of 1300 to 1500 pounds an hour.

Taber Production Press

Adaptable for drawing, forming and assembly operations where a variety of conditions are encountered, the Model 129 production press produced by the Taber Instrument Corp., North Tonawanda, N. Y., features hydraulically controlled ram movement with precise elec-



tronic timing features which provide an adjustable preset rate of movement in closing the die or performing an operation. The pressure of the ram is adjustable from 100 pounds to 2 tons. The rate of ram travel is adjustable from 1000 inches per minute down to 10 inches or less per minute by simple manipulation of the controlling valves. The electronic control panel provides for one or more stop periods of varying duration for positions to meet the requirements of the particular work being performed. These presses are furnished in several models and capacities suitable for slow or very rapid operation, and provided with one or more adjustable ram positioning stops, depending upon the service requirements for which they are designed.



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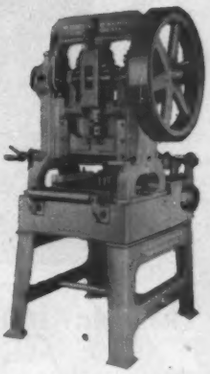
1. MODEL A 1—cutting Heels at high speed production or short runs.

2. Model A 2—cutting Multiple Heels, Half and Full Soles with stock grain.

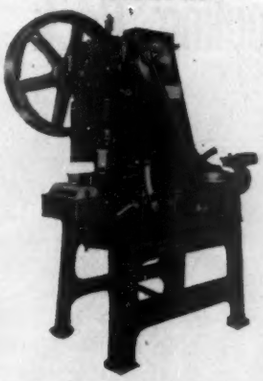
3. Model A 3—cutting Multiple Heels and Taps with or across stock grain.

4. MODEL A2s (Not illustrated) —cutting cross grain of stock.

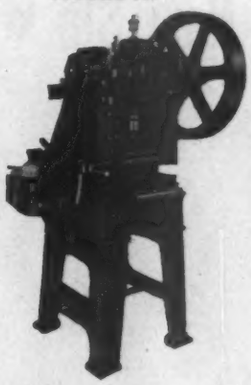


MODEL A2

MODEL A1



MODEL A3



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This new Rack gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Racks having 18 perforated trays 36" x 36" or plain surface trays 36" deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

SPADONE MACHINE COMPANY
10 EAST 43rd ST. NEW YORK 17, N. Y.

Di-Acro Power Shear

A new power shear, designed for close tolerance and high-speed production shearing of a great variety of materials, has been announced by the O'Neil-Irwin Manufacturing Co., Lake City, Minn. Called the Di-Acro Power Shear, the unit will accurately and rapidly cut square, rectangular or other straight sided blanks, shear extremely narrow strips and trim edges of sheets or

parts. The cutting range of the shear extends from the lightest of materials in rubber, plastics, fiber, leather and mica, to heavy gauges of aluminum, cobalt steel, chrome molybdenum, leaded brass, stainless steel and many spring tempered materials.

The Di-Acro Power Shear is operated by a non-repeating positive action clutch, controlled by the operator's choice of either the foot bar or hand lever. A combination blade guard and adjustable hold-down bar insures the safe high speed operation of the unit and prohibits the material from tipping during the shearing operation.

The Di-Acro Power Shear No. 12 has a maximum shearing width of 12 inches, and a maximum capacity of 16-gauge sheet steel. It utilizes a standard 110 to 220-volt single phase motor of 1/3 h.p., with a standard motor speed of 1750 rpm. Its flywheel moves at 200 rpm. Operating height is 34 inches, and the unit takes 18½ x 30 inches in floor space. Net weight of the unit is 450 pounds. The Di-Acro Power Shear No. 24 is similar in many respects to the No. 12, but has a maximum shearing width of 24 inches. This model utilizes a ½ h.p. motor, and takes 18½ x 40 inches in floor space. It weighs 650 pounds.

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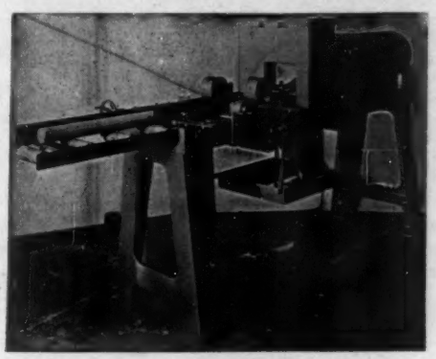

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Strainers
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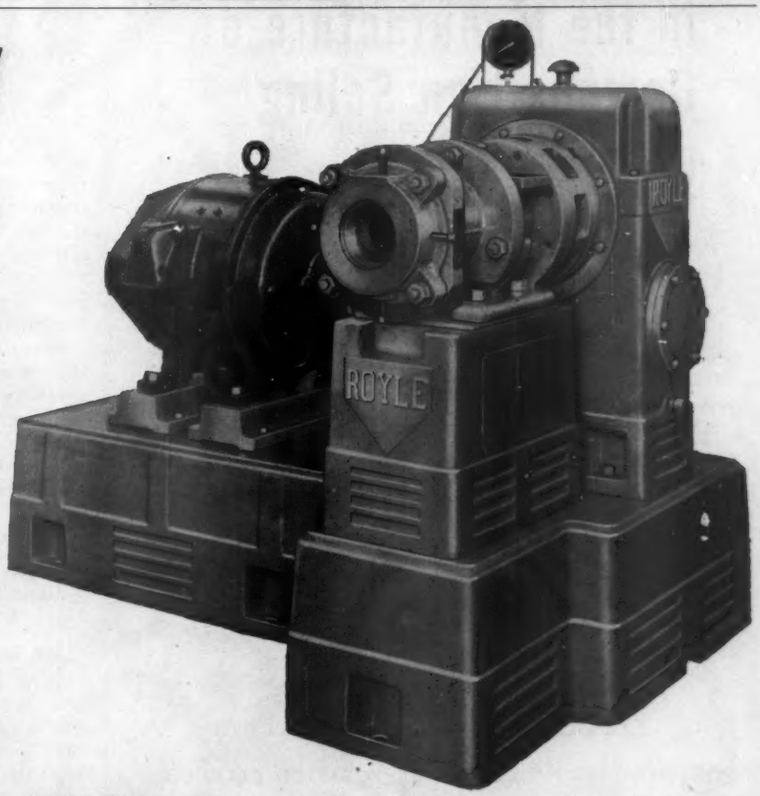
Cooling Troughs
•
Light Wire and Cable Capstans
•
Motorized Take-Ups
•
Temperature Control Units



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ROYLE No. 2 Extruding Machine. Non-extended cylinder, plain tubing head, direct coupled drive. This extruding machine is designed for conventional applications in the rubber field.

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REVIEWS

BOOKS

Elastomers and Plastomers: Vol. II. Manufacture, Properties, and Applications. Edited by R. Houwink. Printed in the Netherlands. Available in the Western Hemisphere from the Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N.Y. 6¾ x 10 in. 516 pp. $9.00.

This is the second of three volumes in the Elsevier Polymer Series which are devoted to the chemistry, physics and technology of elastomers and plastomers. Vol. I, which will be devoted to general theory, has not yet been published, but Vol III, covering testing and analysis, and giving tabulation of properties, was published a few months ago (see Rubber Age, page 228, May, 1949). Like other volumes in this series, the current work consists of contributions made by leading experts in the field. There are 13 chapters in all, in addition to a cross-referenced subject index, titles and authors being as follows:

(1) Phenol-Formaldehyde Plastomers, by R. Houwink; (2) Synthetic Resin Iron Exchangers, by A. van Royen; (3) Urea and Melamine Resins, by G. Widmer and K. Frey; (4) Polymers from Ethylene Derivatives, by H. T. Neher; (5) Cellulose Derivatives, by V. E. Yarsley, H. Kitchen, and W. J. Grant; (6) Protein Plastics, by A. D. Whitehead, S. H. Pinner and C. Diamond; (7) Synthetic Polyamides, by L. F. Salisbury; (8) Silicone Polymers, by J. R. Elliott; (9) Alkyd Resins, by J. R. Patterson; (10) Natural Resins and Their Derivatives, by I. C. Clare; (11) Derivatives of Natural Rubber, by T. R. Dawson; (12) Synthetic Rubbers, by W. J. S. Naunton; (13) Asphalts, by R. N. Traxler.

•

After the Whistle Blows. By Jack Petrill. Published by the Industrial Recreation Bureau, 162 West 56th St., New York 19, N.Y. 5¾ x 8½ 350 pp. $10.00

Public recreation is today an established state and municipal government service. However, since the recreation and relaxation planned for the average worker must take into consideration his life and work in the plant, obviously industry can best fulfill his needs. As the author indicates in his introduction to this book, industrial recreation and municipal systems are not competitive, but rather are complementary and supplementary and together give better service to the community, each fulfilling its own responsibilities and both cooperating for the benefit of the whole. The administration of industrial recreation programs, with its problems and solutions, is covered in this volume in a detailed discussion of programs, advantages and disadvantages of centralized programs, internal organization of the plant, finances, activities, etc. Specific case histories are cited, and the history and tradition of industrial recreation is covered.

•

Directory of British Rubber Manufacturers: 1949. Published by the Federation of British Rubber Manufacturers' Associations, 43 Bedford Square, London, W.C.1, England. 8½ x 11 in. 290 pp.

Edited for importers of British-manufactured rubber goods, this excellent directory contains sections in English, French and Spanish. It includes an alphabetical listing of British rubber manufacturers, with overseas, distributors shown in each instance; a classified index of rubber products, with suitable keys in French and Spanish, and an index of trade marks and trade names. In addition there are two extensive advertising sections, one containing advertisements of a general nature, and the other devoted to tires, tubes and tire repair materials. The directory is the first guide to the British rubber manufacturing industry which has been made available to date, and subsequent editions are planned by the publishers.

BOOKLETS, CATALOGS, etc.

Employee Communications for Bettter Understanding. National Association of Manufacturers, 14 West 49th St., New York 20, N. Y. 6 x 8½ in. 32 pp.

The conflict of ideologies which characterizes our times lends special significance to a question that has long been of national concern. That is, to what extent do employees and the public understand the basic facts about our free enterprise system. Related to this question is one that has received increasing attention of late—to what extent do industrial employees get the facts about the companies for which they work, and how much do they know about its operations, its policies and its practices as they affect them as individuals. This booklet presents a program for industry and makes some practical suggestions to guide employers in doing a better job of learning what their employees want and in keeping them fully informed.

•

Cabot Reinforcing Carbon Blacks for Rubber. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 8½ x 11 in. 60 pp.

Details of tests on each of seven Cabot blacks in natural rubber, standard GR-S and neoprene at four loadings in each rubber are presented in this technical bulletin. For easy comparison the test results are presented in graph form so that the effect of type and grade of carbon black, as well as the effect of loading on the properties of rubber, can be readily evaluated. Somewhat more complete data showing the effect of cure is presented in a series of tabulations. For a specific property or set of properties, the data indicates the type of carbon black and the loading which is suitable for the purpose.

•

Vistanex Tank Linings. (BV-1). Enjay Co., Inc., 15 West 51st St., New York 19, N.Y. 8½ x 11 in. 5 pp.

The data presented in this report shows laboratory evaluations of two tank lining compounds containing Vistanex. The processing behavior observed during mixing, calendering and plying-up operations is outlined. Original physical properties, resistance to various chemicals, specific gravity and costs are also presented.

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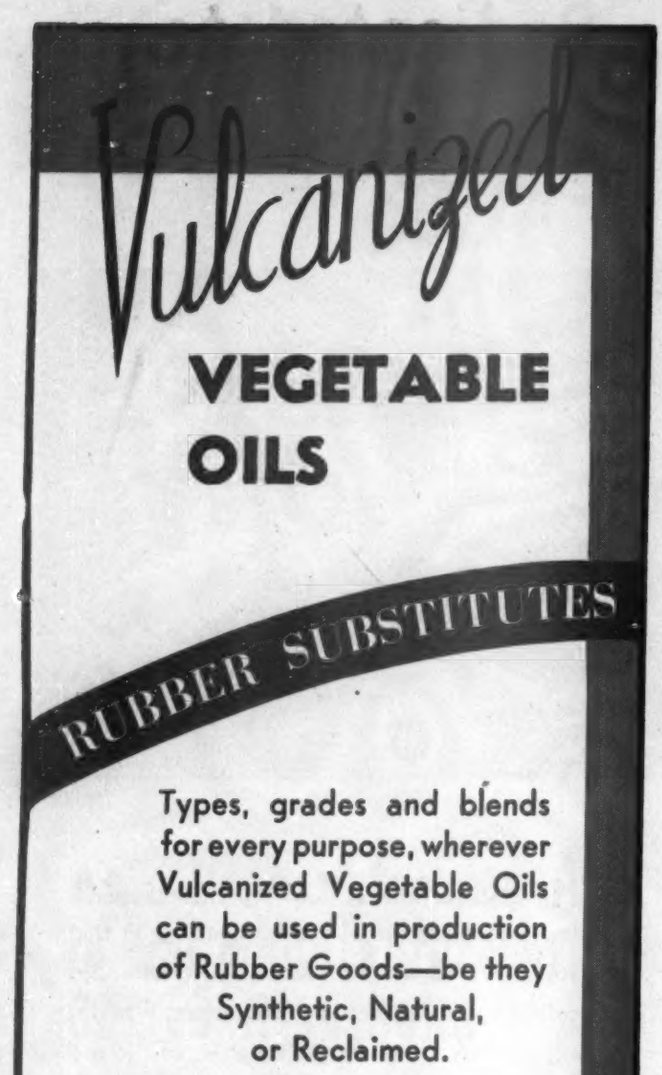
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REVIEWS (CONT'D)

Belfield Diaphragm Control Valves (Bulletin 700-1). 8 x 10½ in. 32 pp.

Belfield Liquid Level Controllers. (Bulletin 48-1). 8 x 10½ in. 32 pp.

Belfield Hi-Lift V-Port Indicating Type Hand Control Valve. (Bulletin 242-1). 8½ x 10 in. 20 pp.

Issued by the Belfield Valve Division, Minneapolis-Honeywell Regulator Co., Philadelphia 44, Penna.

As indicated by the titles, these three bulletins discuss diaphragm control valves, liquid level controllers and the Hi-Lift V-Port indicating type hand control valve produced by the company. Many schematic drawings, diagrams and photographs illustrate the different units. Also offered where applicable are flow characteristics, temperature rating charts, and dimension tables, as well as shipping weights and capacity charts.

•

Plasticized Polyvinyl Chloride Formulations. (Technical Bulletin O-D-113). Development Dept., Organic Chemicals Division, Monsanto Chemical Co., St. Louis 4, Mo., 8½ x 11 in. 13 pp.

This bulletin contains twenty-two plasticized polyvinyl chloride formulations with the outstanding properties of each noted. The formulations, based on extensive laboratory and field work, are representative of types used in manufacturing a wide range of articles, from shower curtains and raincoats, to upholstery material and floor tile. Although eight of the plasticizers suggested are from Monsano's line of vinyl plasticizers, the bulletin recommends other plasticizers and stabilizers as well. It also includes a comprehensive list of polyvinyl chloride resin, plasticizer and stabilizer suppliers.

•

The Foreign Trade Gap. By George Halm and Harry Hawkins, National Association of Manufacturers, 14 West 49th St., New York 20, N.Y., 8½ x 11 n. 38 pp.

The foreign trade gap between most of the countries abroad and the United States—the situation in which these countries must have American imports but cannot pay for them by their own exports—is discussed in this booklet. Prepared for the National Association of Manuacturers by a group of Tufts College economists, the report examines the international trade situation with regard to loans and gifts, import-export balances and surpluses, alternative programs, and the ultimate effects upon the American economic system and the American "philosophy".

•

Compounding and Processing of Low Temperature GR-S Tire Tread Stocks. (BL-231). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6 x 9½ in. 8 pp.

This report presents a practical formulation for tire treads based on low temperature GR-S compounded with HAF carbon black. The effectiveness of RPA No. 3 as a chemical plasticizer for this type of GR-S is shown. Two mixing procedures are outlined, and test data are presented showing the superior tread wear of low temperature GR-S compared with that of regular GR-S.

•

Magnetic Motor Control. (Bulletin TEB-8). Trumbull Electric Mfg. Co., Plainville, Conn. 9 x 11 in. 22 pp.

Serving to introduce a new line of magnetic motor controls, this bulletin contains complete product data on types of disconnects, reversing starters, non-reversing starters, reversing contactors, non-reversing contactors, and combination magnetic starters. The different parts of the magnetic starter are illustrated and described, with advantages stressed. A complete listing of the company's equipment is also included.

California's Industrial Resources—A Summary of the Major Factors in Plant Location. Research Department, California State Chamber of Commerce, 350 Brush Street, San Francisco 4, Calif. 6 x 9 in. 34 pp.

Salient information concerning California markets, distribution, transportation, raw materials, labor supply and cost, and fuel, water and power supply is presented in this booklet. All phases covered are essential to plant location study and to California utilities, banks, railroads and other institutions contacting manufacturing concerns seeking California conditions.

•

Cabot Carbon Blacks: Electrical Conductivity Study. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 8½ x 11 in. 12 pp.

This report contains quantitative data on the influence of carbon black upon the conductiivty of rubber. The investigation was pursued with three chosen variables: type or grade of carbon black, loading of carbon black, and type of rubber. Standardized procedures were employed on the mixing of rubber compounds, and also in the vulcanization of the standard test slab at optimum cure. Results of these investigations as well as the procedure for measuring the electrical resistance are offered in the report.

•

Link-Belt Gearmotors. (Book No. 1815-A). Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill. 8½ x 11 in. 12 pp.

Gear motors offered by the company are discussed and outlined in this booklet. Double and triple reduction models are presented as to design features, dimensions, use, selection, etc. A table is devoted to overhung loads, the maximum allowable loads and minimum recommended sprocket diameters. The booklet is illustrated with engineering drawings and photographs.

•

Higher Diols. Carbide and Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in. 8 pp.

Data on the physical, chemical and physiological properties of some of the higher diols now being produced by Carbide and Carbon is given in this informative brochure. Among these are butanediol, pentanediol, methylpentanediol, hexanediol, substituted pentanediols, and ethylhexanediol. Among specific industrial applications listed are those in the textile, paper, leather, machinery and cosmetic fields.

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, AUGUST 8, 1949

Natural Rubber

The price of spot rubber on the Commodity Exchange has swung in the rather narrow range of 82 points since our last report (July 11), high for the period being 16.88 cents reached on July 13, and low being 16.06 cents reached on August 2 and 3. The average price of spot rubber for the month of July was 16.45 cents based on 20 trading days. This compares with an average of 16.36 cents for the month of June.

The Economic Cooperation Administration has purchased fair quantities of rubber on the London Rubber Exchange during this past period for U. S. stockpiling, rubber market circles report. The total to be bought has not been decided. It is believed that buying will be spread over a long period and will be made in moderate amounts so that market prices will not be upset.

To provide funds for a world-wide publicity campaign, the High Commissioner for Malaya agreed to increase the export tax on rubber from 25 to 40 cents a pound. Three million Straits dollars (about $1,500,000) are expected to be collected over 17 months.

The Secretariat of the Rubber Study Group has estimated world production of natural rubber in May at 115,000 tons, and consumption at a like figure. For the five-month period ended in May, 585,000 tons of natural rubber were produced and 612,500 tons consumed, the Secretariat estimates.

Today's quotations on the outside market, London and Singapore follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.16⅜
October-December	.16¼
January-March	.16⅛
Thin Latex Crepe:	
Spot	.21¾
August	.21¾
Thin Brown Crepe, No. 2	.14
Ambers, No. 3	.14
Flat Bark Crepe	.11¾

London Market

(Standard Smoked Sheets)

September	17.30 - 17.50
October-December	16.76 - 16.86

Singapore Market

(Standard Smoked Sheets)

August	15.62 - 15.72

Synthetic Rubber

(Dry Types-Per Pound)

Butaprene NF	.390 - .415
Butaprene NL	.400 - .425
Butaprene NAA	.440 - .465
Butaprene NXM	.470 - .495
Chemigum 30 N4NS	.400 - .470
Chemigum 50N4NS	.400 - .470
Chemigum N3	.450 - .520
GR-I	—— - .185
GR-S	—— - .185
Hycar OR-25	.450 - .460
Hycar OR-15	.520 - .530
Hycar OS-10	.500 - .510
Neoprene Type E	—— - .650
Neoprene Types CG and AC	—— - .500
Neoprene Types FR and KNR	—— - .750
Neoprene Type S	—— - .320
Paracril 18	.430 - .450
Paracril 26	.440 - .460
Paracril 35	.510 - .530
Silastic (compounded)	2.35 - 4.40
Thiokol Type A	.370 - .470
Thiokol Type ST	.750 - .850
Thiokol Type FA	.520 - .620
Thiokol PR-1	.750 - .850

Scrap Rubber

Seasonal influences have contributed to what has otherwise been an extremely low level for scrap rubber activity. Familiar reasons are advanced to explain the lethargic market, with standstill export conditions a primary factor. Trade sources do not venture any predictions for the months that lie ahead. Scrap prices remain at the same levels. Current quotations follow:

Mixed passenger tires	ton	$12.00
Beadless truck tires	ton	nom.
Mixed truck tires	ton	13.00
Beadless passenger tires	ton	nom.
No. 1 passenger peelings	ton	42.50
No. 1 truck peelings	ton	42.50
Red passenger tubes	lb.	.06½
Black passenger tubes	lb.	.03½
Mixed passenger tubes	lb.	.03½
No. 2 truck tubes	lb.	nom.
Red truck tubes	lb.	.06½
Black truck tubes	lb.	.03¼
Buffings	ton	15.00

Reclaimed Rubber

Consumption of reclaim for the month of June is estimated at 19,335 tons by the Department of Commerce. This compares with 18,323 tons in the month of May. Estimated consumption of reclaim for the first six months of 1949 is 112,578 tons. Ratios for reclaim consumption to total new rubber consumption continue at levels substantially below that established the year previous. Current quotations follow:

Tires

Black, Digester (Natural)	lb.	.08¼ - .08¾
Peels No. 1	lb.	.08½ - .09¼
Whole Tire (Blend)	lb.	.08¼ - .08¾

Inner Tubes

Black (Natural)	lb.	.11½ - .12
Red (Natural)	lb.	.13½ - .14½
Butyl	lb.	.08¼ - .08¾

Shoe

Unwashed (Natural)	lb.	.08¾ - .09¼

Cotton Tire Fabrics

The market for cotton tire fabrics continues at the low levels maintained the past few months. The instability of the domestic market, changeover to rayon and nylon cords, and the stalemated export market have contributed to the general picture. Price levels, recently adjusted downward, are expected to hold in the forseeable future. Current quotations follow:

Standard, Peeler, 12/4/2	lb.	.68
Standard, Peeler, 14/4/2	lb.	.70
Standard, Peeler, 16/4/3	lb.	.7250
Extra Staple, Peeler, 12/4/2	lb.	.8315
Extra Staple, Peeler, 14/4/2	lb.	.8575
Extra Staple, Peeler, 16/4/3	lb.	.8825

Chafers

14.4 oz. (per sq. yard)	lb.	.67
9.25 oz. (per sq. yard)	lb.	.6325
11.65 oz. (per sq. yard)	lb.	.60
8.9 oz. (per sq. yard)	lb	.6475

Cotton

The price of middling uplands on the Cotton Exchange has swung in the narrow range of 1.08 cents since our last report (July 11), high for the period being 33.40 cents reached on July 13, and low being 32.32 cents on August 8. The average price of middling uplands for the month of July was 32.99 cents based on 20 trading days. This compares with an average of 33.56 for the month of June.

The Department of Agriculture recently announced that it will support grower prices of 1949 crop cotton at a base rate of 27.23 cents a pound. This rate is the average for ⅞ inch middling cotton, on a gross weight basis. The rates for 15/16 inch middling, the grade and staple used by the cotton markets for determining price differentials, will average 29.43 cents a pound.

The House has passed a bill limiting cotton acreage in 1950 to 21,000,000 acres. The bill specifies that long staple cotton, 1⅛ inch or more, shall be exempt from cotton marketing quotas unless the Agriculture Department decides that a separate marketing quota system should be set up for the long staple fiber.

Trade circles report that cotton exports are expected to be stepped up shortly, as the prospects for passage of ECA appropriations grows brighter. Exports of cotton for the season ended August 1 were estimated at 4,783,000 bales. Washington reports, however, that some ECA countries are cutting their requests for cotton below original levels due to the 10% reduction in ECA funds.

Quotations for middling uplands on the Exchange follows:

	July 11	August 8		
	Close	High	Low	Close
October	29.50	29.88	29.79	29.82
December	29.37	29.85	29.75	29.83
March	29.29	29.78	29.71	29.77

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM JULY 12 TO AUGUST 8

Date	Spot	Sept.	Dec.	Mar.	May	Sales
July						
12	16.75	16.75	16.55	16.30	16.20	204
13	16.88	16.75	16.51	16.30	16.20	89
14	16.75	16.55	16.27	16.03	15.93	123
15	16.62	16.48	16.25	15.95	15.85	125
16	——	——	——	——	——	——
17	——	——	——	——	——	——
18	16.38	16.30	16.05	15.80	15.70	70
19	16.32	16.19	16.00	15.70	15.60	91
20	16.62	16.58	16.30	15.06	15.96	153
21	16.38	16.25	16.01	15.80	15.70	160
22	16.32	16.20	16.00	15.85	15.70	88
23	——	——	——	——	——	——
24	——	——	——	——	——	——
25	16.38	16.32	16.15	15.95	15.80	23
26	16.50	16.37	16.20	16.05	15.90	71
27	16.62	16.48	16.38	16.19	16.04	130
28	16.62	16.47	16.38	16.13	15.98	132
29	16.25	16.25	16.05	15.86	15.70	72
30	——	——	——	——	——	——
31	——	——	——	——	——	——
Aug.						
1	16.25	16.17	16.00	15.85	15.68	12
2	16.06	16.05	15.86	15.67	15.52	127
3	16.06	15.98	15.73	15.60	15.43	182
4	6.12	16.02	15.77	15.99	15.44	53
5	16.12	16.10	15.80	15.60	15.45	124
6	——	——	——	——	——	——
7	——	——	——	——	——	——
8	16.42	16.50	16.11	15.98	15.78	105

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Meticulous workmanship has been a tradition at Brockton Cutting Die for three generations. That's why rubber manufacturers turn to us for quality dies of all kinds . . . for dies that really retain their cutting edge. Our experience and facilities enable us to turn out a cutting die for every type of service.

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BROCKTON CUTTING DIE & MACHINE CO. INC.
CUTTING AND PERFORATING DIES

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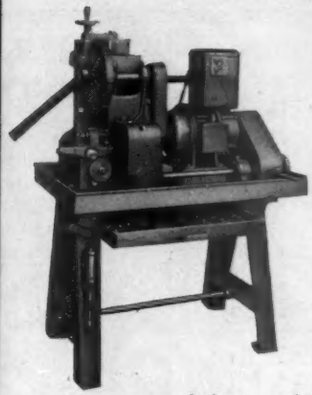
For Immediate Shipment..
Thropp Automatic
Washer Cutters



THE Thropp Automatic Washer Cutter does not require mandrels. It will cut washers for hose connections, bottle stoppers, plumbers' washers, synthetics, uncured stock for molds, etc. A single unskilled operator can run one or more of these machines at the same time. Size of Cuts: 1/4" in diameter to 1 3/4" inclusive, and from 3/32" to 1 1/2" in length.

Capacity: 100 cuts per minute on long lengths and big diameters; and 200 cuts per minute on narrow widths and small diameters.

Shipment: Shipment can be made from stock on a limited number of units complete with motor and control, wired and ready for installation.

- *West Coast Rep.:* H. M. Royal, Inc., Los Angeles, Cal.
- *Export Agent:* Steinhardter & Nordlinger, 105 Hudson St., N.Y.

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WM. R. THROPP & SONS CO. Trenton, N.J.

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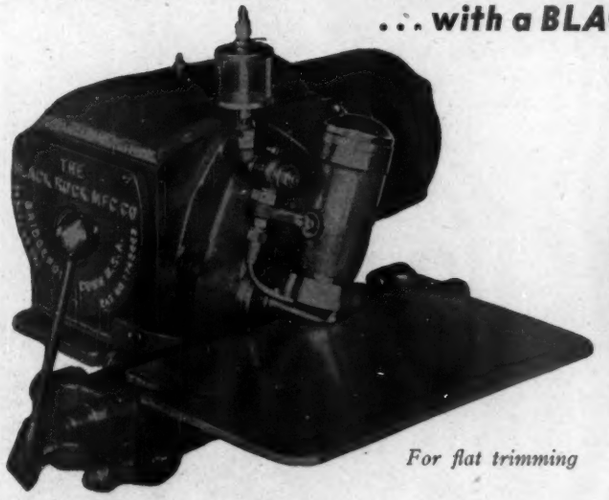
. . . with a BLACK ROCK 4T A



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For circular trimming

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- Mechanism completely enclosed
- Ball bearing mounted

The Black Rock 4TA Rubber Trimmer is the most compact, sturdy . . . yet flexible machine made. Designed for accurate and rapid work, it trims flat as well as circular pieces and possesses many exclusive features.

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Pacific Rep. Lombard Smith, Los Angeles, Cal.
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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

AUGUST 8, 1949

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

a East of Mississippi.

—The arrangement of this section follows closely the Chemical Section of the 1947 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.

—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.

—All requests for information or listings should be sent to Market Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

ACCELERATORS

A-1	lb.	.34	.39
A-10	lb.	.40	.47
A-19	lb.	.52	.58
A-32	lb.	.59	.69
A-77	lb.	.42	.55
A-100	lb.	.42	.55
Accelerator No. 8	lb.	—	.83
Accelerator—49	lb.	.44	.45
Accelerator—89	lb.	—	1.20
Accelerator—122	lb.	—	1.30
Accelerator—552	lb.	—	1.80
Accelerator—808	lb.	.59	.61
Accelerator—833	lb.	1.13	1.15
Acrin	lb.	—	.75
Acro AC-165	lb.	.37	.39
Altax	lb.	.35	.37
Arazate	lb.	—	2.16
Beutene	lb.	.59	.61
Bismate	lb.	—	3.00
B-J.F	lb.	.27	.29
Butasan	lb.	—	1.00
Butazate	lb.	—	1.00
Butyl Eight	lb.	1.00	1.25
Captax	lb.	.27	.29
C-P-B	lb.	—	1.95
Cumate	lb.	—	1.45
Cuprax	lb.	.60	.62
Dibenzo G-M-F	lb.	—	2.65
Diorthotolyguanidine	lb.	.48	.50
Diphenylguanidine	lb.	.39	.45
El-Sixty	lb.	.39	.46
Ethasan	lb.	—	1.00
Ethazate	lb.	—	1.00
Ethyl Thiurad	lb.	—	1.00
Ethyl Tuex	lb.	—	1.00
Formaniline	lb.	—	.40
G-M-F	lb.	—	2.50
Good-rite Erie	lb.	.32	.34
Guantal	lb.	.47	.54
Hepteen	lb.	.42	.44
Base	lb.	1.80	1.85
Ledate	lb.	—	1.00
Mercaptobenzothiazole	lb.	.27	.29
Mercaptobenzothiazyl Disulfide	lb.	.35	.37
Methasan	lb.	—	1.00
Methazate	lb.	—	1.00
Monex	lb.	—	1.10
Mono Thiurad	lb.	—	1.10
Morfex	lb.	.53	.55
2-MT	lb.	.53	.55
Novac	lb.	—	1.40
A-13	lb.	.65	.67
O-X-A-F	lb.	.34	.36
Pentex	lb.	.74	.77
Flour	lb.	.12¼	.12¾
Phenex (tons)	lb.	—	.40
Pipazate	lb.	—	1.53
Pip-Pip	lb.	—	1.80
R-2 Crystals	lb.	—	1.75
RN-7 (dms.)	lb.	—	1.65
Rotax	lb.	.39	.41
SA 52	lb.	—	1.10
SA 57	lb.	—	1.00
SA 62	lb.	—	1.00
SA 66	lb.	—	1.45
SA 67	lb.	—	1.00
SA 77	lb.	—	1.00
Safex	lb.	—	1.15
Santocure	lb.	.55	.62
Selazate	lb.	—	1.45
Selenac (Ethyl, Methyl)	lb.	—	1.45
Setsit-5	lb.	.75	1.00
SPDX-GH (tons)	lb.	.64	.69
Tellurac	lb.	—	1.45
Tepidone	lb.	—	.55
Tetrone	lb.	—	1.25
A	lb.	—	1.85
Thiocarbanilide	lb.	.34	.39
Thiofide	lb.	.35	.42
Thionex	lb.	—	1.10
Thiotax	lb.	.27	.34
Thiurad	lb.	—	1.10
Thiuram E	lb.	—	1.00
M	lb.	—	1.10
Trimene	lb.	.54	.56
Base	lb.	1.03	1.06
Triphenylguanidine	lb.	—	.83
Tuads, Ethyl	lb.	—	1.00
Tuads, Methyl	lb.	—	1.10
Tuex	lb.	—	1.10
Ultex (tons)	lb.	—	1.00
Unads	lb.	—	1.10
Ureka	lb.	.55	.62
Blend B	lb.	.55	.62
C	lb.	.55	.62
Vitasan Crystals	lb.	.48	.53
Vulcanex	lb.	—	.45
Z-B-X	lb.	—	2.45
Zenite	lb.	.33	.35
A	lb.	.42	.44
B	lb.	.39	.41
Zenite Special	lb.	.34	.36
Zetax (coated)	lb.	.33	.35
(uncoated)	lb.	.34	.36
Zimate, Butyl	lb.	—	1.00
Zimate, Ethyl	lb.	—	1.00
Zimate, Methyl	lb.	—	1.00

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.15¾	.16¾
Fish Oil, Hydrogenated, Fatty Acid			
Hydrofol Acid (dlvd.)	lb.	.10	.13
Hyfac 430 (dlvd.)	lb.	.15½	.16½
Neo-Fat H.F.O. (dlvd.)	lb.	.20	.21
Stearex Beads (dlvd.)	lb.	.28	.29½
Lime, Hydrated			
Arrowhead	ton	19.50	20.65
Sierra	ton	19.50	20.65
Litharge			
Eagle (dlvd.)	lb.	—	.1750
FBS (dlvd.)	lb.	—	.1750
Magnesium Oxide, Heavy			
General Magnesite	lb.	.05½	.08
Michigan No. 15	lb.	.0550	.0600
Permanente	lb.	.05	.06½
Magnesium Oxide, Light			
Baker's (Neoprene Grade)	lb.	—	.28
General Magnesite (Neoprene Grade)	lb.	—	.31
General Magnesite No. 101	lb.	—	.19
General Magnesite Standard	lb.	—	.22
K & M (Neoprene Grade)	lb.	—	.31
Maglite "M" (l.c.l.)	lb.	—	.31
Marine's (Neoprene Grade (l.c.l.)	lb.	—	.31
Michigan No. 30	lb.	—	.24
No. 40 Extra Light	lb.	—	.31
Witco Extra Light	lb.	.25	.27

ACTIVATORS (Cont'd)

Oleic Acid			
Emersol 210 (dlvd.)	lb.	.10¼	.12
L.C.P. Red Oil	lb.	.25½	.27¼
Red Oil (20-24 Saponified) (dlvd.)	lb.	.08¾	.10½
Palm Oil Fatty Acid (c.l.)	lb.	—	.11
Potassium Oleate (drums)	lb.	—	.29½
Red Lead			
Eagle	lb.	—	.1850
No. 2 RM (dlvd.)	lb.	—	.1850
Sodium Laurate (drums)	lb.	—	.19
Sodium Oleate—Powder (drums)	lb.	—	.35
Paste (drums)	lb.	—	.20
Sodium Stearate—Powder (drums)	lb.	—	.35
USP Grade (drums)	lb.	—	.37
Stearic Acid, Single Pressed			
Emersol 110 (dlvd.)	lb.	.13	.14
Stearex B (dlvd.)	lb.	.22	.23
Stearic Acid, Double Pressed			
Alba (dlvd.)	lb.	.24¾	.25¾
S-2-A (dlvd.)	lb.	.22½	.23½
S-2-B (dlvd.)	lb.	.22	.23
Stearic Acid, Other			
Neo-Fat 1-60 (dlvd.)	lb.	.19½	.20½
Neo-Fat 1-65 (dlvd.)	lb.	.22	.23
Stearite	cwt.	36.00	38.00
White Lead Basic Carbonate	lb.	.16½	.17½
White Lead Basic Sulfate	lb.	.20¾	.21¼
Zinc Laurate (c.l.)	lb.	—	.29
Laurex	lb.	.28	.29
Zinc Stearate	lb.	.40	.43
Aquazinc	lb.	.20	.35

Unclassified Activators

Actifat (dms.)	lb.	—	.18
Acidex	lb.	.09	.15
Aero Ac 50	lb.	.50	.56
165	lb.	.37	.39
Barak	lb.	—	.60
D-B-A	lb.	—	1.95
Delac J	lb.	.55	.57
Dibutylamine (dlvd.)	lb.	.49	.52½
NA-11	lb.	—	.65
Palmalene (drums)	lb.	—	.15
Polyac	lb.	—	1.40
Ridacto (drums)	lb.	.22	.24
Snodotte (dlvd.)	lb.	.14½	.15½
SOAC (min. 10 dms.)	cwt.	—	10.00
SOAC-KL (min. 10 dms.)	cwt.	—	10.00

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.17	.21
National (cyl., dlvd.)	lb.	.16	.20
Aqua Ammonia (l.c.l., dms.)	lb.	.0285	.0325
M.B.M. (l.c.l.)	lb.	—	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	—	.12
Regular	lb.	—	.08½
D.C. Antifoam A	lb.	6.00	6.65

ANTI-OXIDANTS

Agerite Alba	lb.	2.20	2.30
Gel	lb.	.58	.60
Hipar	lb.	.82	.84
H. P.	lb.	.61	.63
Powder	lb.	.46	.48
Resin	lb.	.63	.65
Resin D	lb.	.46	.48
Stalite	lb.	.46	.48
White	lb.	1.40	1.50
Akroflex C	lb.	.61	.63
Aminox	lb.	.46	.48
Antox	lb.	.54	.56
Aranox	lb.	—	2.80
Benzoquinone	lb.	1.50	1.75
Betanox Special	lb.	.68	.70
B-L-E	lb.	.45	.48
Carvacrol	lb.	—	.85
Chlorcarvacrol	lb.	—	2.45
Eugenol C-95%	lb.	—	1.28
Flectol H	lb.	.46	.53
Flexamine	lb.	.61	.63
Gallic Acid, Tech.	lb.	1.10	1.23
USP or NF	lb.	1.27	1.40
Hydroquinone	lb.	.90	.90
Monomethylparaminophenol Sulfate	lb.	2.40	2.90
Neozone Standard	lb.	.66	.68
A	lb.	.48	.50
C	lb.	.52	.54
D	lb.	.46	.48
DL	lb.	.48	.50

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A PORTABLE machine capable of stripping slab rubber up to 1" thick at the rate of 20,000 feet in 8 hours. Any width desired.

SPECIAL FEATURES

- Has micro-adjustment for accurate widths.
- Equipped with water tank which feeds water to the slotted knife and to the cut.
- Has repulsion induction motor which carries any over loads.
- Automatic sharpener device keeps knife keen and sharp.
- Has base with rollers and is very easy to handle.

Cuts within 1/64 inch to 1/100 inch tolerance depending on grades of rubber. Cuts a slab down to the last shaving. Cuts all grades of rubber including pure gum, sponge, etc. Cuts squarely—no rejects.

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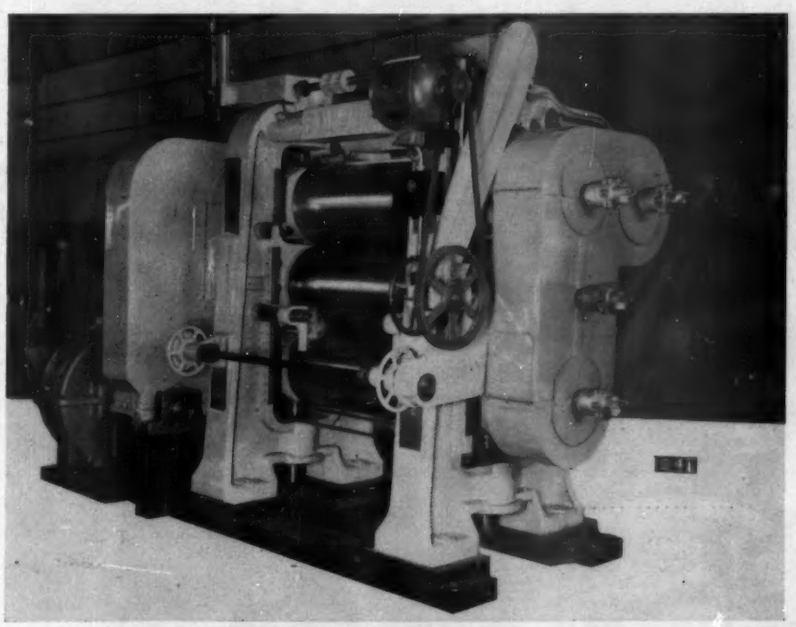

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ANTI-OXIDANTS (Cont'd)

Oxidex	lb.	—	3.40
Parazone	lb.	—	.75
PDA-10	lb.	.36	.38
PDA-20	lb.	.36	.38
Perflectol	lb.	.61	.68
Permalux	lb.	—	1.65
Pyrogallic Acid, Resublimed.	lb.	2.60	2.65
USP Crystals	lb.	2.10	2.15
Resorcin, Tech. (dlvd.)	lb.	—	.64
Santoflex B	lb.	.46	.53
BX	lb.	.57	.64
Santovar-A	lb.	1.30	1.37
Santowhite (crystals)	lb.	1.65	1.72
Santowhite MK	lb.	1.40	1.52
MKS	lb.	1.25	1.37
S.C.R. (tons)	lb.	.32	.34
Solux	lb.	—	2.15
Stabilite (tons)	lb.	—	.46
Alba (tons)	lb.	—	.69
L (tons)	lb.	—	.48
Stabilizer No. 1	lb.	—	1.65
Stabilizer No. 320	lb.	—	.80
Tannic Acid, Tech.	lb.	.70	.79
Thermoflex A	lb.	.82	.84
Thymol	lb.	—	2.50
V-G-B	lb.	.55	.57

ANTI-SCORCHING AGENTS

Armeen HT	lb.	.46	.54
Benzoic Acid—Tech.	lb.	—	.43
Good-rite Vultrol	lb.	.55	.57
Retarder PD	lb.	—	.36
Retarder W	lb.	—	.43
Sodium Acetate 60-62% Crystals	lb.	—	.06

ANTISEPTICS AND GERMICIDES

Arquad S	lb.	.24	.27
Formaldehyde (barrels)	lb.	—	062
G-4 (bbls.)	lb.	.95	2.75
G-11	lb.	3.50	5.50
Methyl Para Hydroxy Benzoate	lb.	—	2.10
Nuodex 100 S.S. (dlvd.)	lb.	—	1.05
Nuodex 100 W.D. (dlvd.)	lb.	—	1.20
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	—	.2125
Ortho Cresol (26°-27°)	lb.	—	.18
Retarder D	lb.	.68	.76
Soligen Drier—Copper 8% (drums)	lb.	—	.22½
Zinc 8% (dms.)	lb.	—	.21½
Vancide	lb.	—	.80

ANTI-WEBBING AGENTS (for Latex)

Webnix 33	lb.	1.75	2.00

AROMATICS (DEODORANTS)

Bouquet 149	lb.	—	3.00
Coumarin	lb.	—	2.75
Curodex 19	lb.	—	4.75
188	lb.	—	5.75
198	lb.	—	6.75
D-6 Masking Perfume	lb.	—	1.35
Deodorant 65	lb.	—	1.00
Deodorant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
General Deodorant 18301.	lb.	—	2.40
Latex Perfume 5	lb.	—	3.25
6	lb.	—	7.50
9	lb.	—	.65
Naugaromes (dms.)	lb.	1.50	3.00
Neutroleum Delta	lb.	—	2.40
Gamma	lb.	—	3.40
Parador A	lb.	1.75	2.25
B	lb.	.70	1.00
C	lb.	2.75	3.25
D	lb.	1.50	2.00
E	lb.	.25	.55
F	lb.	—	.47
I	lb.	—	2.00
K	lb.	—	.43
GD 5280	lb.	—	2.50
GD 5348	lb.	1.90	3.25
Perfume Oil Bouquet Vanilla M	lb.	2.40	2.75
Rodo No. 0	lb.	4.00	4.50
No. 10	lb.	5.00	5.50
Rubbarome (dms.)	lb.	1.05	3.80
Rubber Perfume 12	lb.	—	1.90
Russian Leather 7	lb.	—	4.10
Vanillin	lb.	3.00	3.15

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.0725	.1075
Blowing Agent CP-975	lb.	—	.35
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	—	1.85
Sponge Paste	lb.	—	.20
Unicel	lb.	—	.60
ND	lb.	—	1.50
S	lb.	—	.25
Urea	lb.	.0425	.0475

BONDING AGENTS

Durez 12987	lb.	.48	.53
Interlake Resin No. 4162	lb.	—	1.50
MDI	lb.	7.00	7.75
50	lb.	3.50	4.00
Pliobond 20	gal.	2.75	4.00
30	gal.	3.45	4.70
Reanite	gal.	6.75	7.25
Rex Compounds	gal.	1.30	2.85
Ty-Ply Q (and S)	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	8.11	8.61
Glacial—99½% (bbls.)	cwt.	14.05	14.55
Calcium Nitrate, Tech., Crystals	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	—	.084
Zinc Nitrate, Tech.	lb.	—	.21½

COLORING AGENTS

Black

Carbon Black—See *Reinforcing Agents*			
Aquablak B (also M, R)	lb.	.0775	.0875
Aquablak S	lb.	.08½	.09
Black Shield 4-35 (dms.)	lb.	—	.0825
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)	lb.	.1075	.1100
Raven Black Pure Iron Oxide	cwt.	10.75	11.00

Blue

Blue GD, Dispersed	lb.	—	3.95
Paste	lb.	—	1.80
Blue YD, Dispersed	lb.	—	2.50
Milori Blue 11840 (dlvd.)	lb.	—	.45
Monastral Fast Blue CPL.	lb.	—	1.54
PCD, Dispersed	lb.	—	2.50
PCD Paste	lb.	—	.75
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	—	1.00
Stan-Tone Blue	lb.	1.40	4.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	1.00	2.30
Victoria Blue BP-262-D	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	.1075	.12
Mapico Brown (50 lb. bags)	lb.	—	.1250

Green

Filo Green D-700 (and D-705)	lb.	—	.30
Green Chromium Oxide, Pure	cwt.	35.50	42.00
Green Chromium Oxide, Pure, Hydrated	cwt.	85.00	100.00
Green FD, Dispersed	lb.	—	1.50
Monastral Fast Green GSD. Dispersed	lb.	—	3.20
GSD Paste	lb.	—	1.10
GSL	lb.	—	1.71
Permansa Green CP-594	lb.	—	1.35
Pigment Green B	lb.	—	1.35
GL-652D	lb.	.88	.93
Ramapo Green	lb.	—	4.00
Rubber Green X-1292	lb.	—	1.00
Stan-Tone Green	lb.	1.50	3.30
Utility Green	lb.	—	.30
Vansul Green M.B.	lb.	.85	2.25

Maroon

Stan-Tone Maroon	lb.	3.00	3.05
Vansul Maroon M.B.	lb.	1.05	2.65

Orange

Molybdate Orange	lb.	—	.43
Orange FD, Dispersed	lb.	—	2.75
Rubber Orange X-2065	lb.	—	2.60
Stan-Tone Orange	lb.	1.65	2.25
Vansul Orange M.B.	lb.	2.00	2.75

Red

Antimony Trisulfide	lb.	.55	.68
R. M. P. Sulfur Free.	lb.	.63	.68
R. M. P. No. 3	lb.	.53	.60
Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.20	1.45
Graphic Red (dlvd.)	lb.	—	.80
Indian Red, American, Pure	cwt.	11.50	11.75
Doxco (English)	cwt.	17.00	18.00
Mapico Red 297 (50 lb. bags)	lb.	.1150	.1175
Oximony Iron Oxide	lb.	—	.09
Red Iron Oxide, Light	cwt.	11.50	11.75
Red FBD Dispersed	lb.	—	1.65
2RD, Dispersed	lb.	—	1.65
2BL	lb.	—	1.15
Rubanox Red CP-762 (dlvd.)	lb.	—	1.40
Rubber Red CP-339 (dlvd.)	lb.	—	1.05
Rubber Red RT-364	lb.	—	.75
Rubber Red RT-425	lb.	—	.75
Rubber Red X-1148	lb.	—	.80
Rubbered	lb.	.16	.18
Solfast Red CP-663 (dlvd.)	lb.	—	1.80
CP-787 (dlvd.)	lb.	—	1.30
Stan-Tone Red	lb.	1.10	3.05
Sun Burnt Red	lb.	16.	.18
Vansul Red M.B.	lb.	.80	2.30
Watchung Red	lb.	—	1.80

White—Lithopone

Albalith	lb.	.06¼	.06½
Astrolith	lb.	.06¼	.06⅝
Cryptone No. 19	lb	.07⅜	.08
CB No. 21	lbl	.07¾	.08
Eagle	lb.	.06¼	.06½
Permalith	lb.	.06¼	.06⅝
Ponolith	lb.	.06¼	.06⅝
Sunolith	lb.	.06¼	.06⅝

White—Titanium Pigments

Rayox	lb.	.19½	.22½
Ti-Cal	lb.	.07¾	.08¼
Ti-Pure	lb.	.21½	.22½
Titanox A—all grades (dlvd.)	lb.	.19½	.20½
B-30 (dlvd.)	lb.	.07	.07½
C (dlvd.)	lb.	.06¾	.07¼
RA—all grades (dlvd.)	lb.	.21½	.22½
RC-HT (dlvd.)	lb.	.07½	.08
Unitane O-220	lb.	.195	.205
OR-250	lb.	.215	.225
Zopaque	lb.	.19½	.20½

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 33, 44, 55)	lb.	.11	.11¼
Eagle	lb.	.11	.11¼
Horse Head Special	lb.	.11	.11¼
XX Red	lb.	.11	.11¼
XX-505	lb.	.12½	.12¾
Protox 166	lb.	.11	.11¼
St. Joe Black Label	lb.	.11	.11¼
Green Label	lb.	.11	.11¼
Red Label	lb.	.11	.11¼

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	—	13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.13¼	.13½
Eagle Green Seal	lb.	.12¾	.13
Eagle Red Seal	lb.	.12¼	.12½
Eagle White Seal	lb.	.13¼	.13½
Florence Green Seal	lb.	.12¾	.13
Red Seal	lb.	.12¼	.12½
White Seal	lb.	.13¼	.13½
Kadox 25	lb.	.13¼	.13½
Kadox 15, 17 and 72	lb.	.11	.11¼
U. S. P. 12	lb.	.14¼	.14½

White—Zinc Sulfide

Cryptone ZS-800	lb.	.13¼	.13½

Yellow

Anchor Brand Pure Iron Oxide	cwt.	9.00	9.25
Cadmolith Yellow (bbls.)	lb.	—	.95
Chrome Yellow	lb.	—	.30¼
Chrome Yellow 12310	lb.	—	.34
Ferrox	cwt.	7.50	8.50
Mapico Yellow (50 lb. bags)	lb.	.0900	.0925
Rubber Yellow X-1940	lb.	—	1.60
Stan-Tone Yellow	lb.	1.20	1.75
Toluidine Yellow	lb.	—	1.70
YL-556-D	lb.	—	.82
Oximony Iron Oxide	lb.	—	.06¾
Vansul Yellow M.B.	lb.	.90	1.00
Yellow GD, Dispersed	lb.	—	1.85
GL	lb.	—	1.35
HV Paste	lb.	—	.34
Zinc Yellow	lb.	—	.24

DESTABILIZING AGENTS (for Latex)

D-Stayb	lb.	—	1.60

DISPERSING AGENTS

Agchem SA-19	lb.	—	.30
SA-20	lb.	—	.70
Aquasol AR 90%	lb.	—	.24¾
Armeen 18	lb.	.52	.60
Beaconol 52	lb.	.60	.75
Darvan No. 1 (and No. 2)	lb.	.21	.30
Daxad 11 (21, 23)	lb.	.08	.35
Dilex	lb.	—	.32
Dispersaid	lb.	1.25	1.35
Halloid	lb.	.03¾	.09½
HornKem No. 1	gal.	—	1.60
No. 3G	gal.	—	1.75
No. 12	lb.	—	.17
Lomar PW	lb.	.16	.18
Marasperse CB	lb.	.11½	.15
N	lb.	.09	.10
Rubbex	lb.	—	.27½
Stan-Chem BQC	lb.	.12¼	.17¼
1067	lb.	—	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¼
Trenamine D-25	lb.	.32½	.36
D-100	lb.	.48	.51
Triethanolamine (drums) (dlvd.)	lb.	.21½	.22½
Triton R-100	lb.	.15½	.26
Yelkin TT	lb.	—	.22
Zinsper	lb.	—	.15

EXTENDERS

Advagum 1098	lb.	—	.65
Bunaweld Polymer No. 780.	lb.	—	.22
No. 5514	lb.	—	.30
D-92 (and D-93) (dms.)	lb.	—	.12
Extender 600	lb.	—	.1790
PR-162 Latex (dms.)	gal.	1.00	1.60
Synprolac	lb.	—	.19
Synprowax	lb.	.16	.19
Vistanex	lb.	—	.32

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.15	.95
Lionite	lb.	.09¾	.90
Pumice	lb.	.03	.05
Aluminum Hydrate	lb.	—	.17

Marbon "S" and "S-1"

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Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

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FILLERS (Cont'd)

Aluminum Silicate			
Silical	ton	37.00	- 55.00
Marter White	ton	18.50	- 30.00
Barium Carbonate (l.c.l.)	ton	72.50	- 90.00
Barytes			
No. 1 Floated, White	ton	34.85	- 49.65
No. 2 Floated, Unbleached	ton	——	- 32.85
No. 22 Barytes (c.l.)	ton	——	- 18.37
Foam A	ton	——	- 34.85
Bentonite (c.l.)	ton	——	- 11.50
SPV Volclay (c.l.)	ton	——	- 11.50
Blanc Fixe	ton	72.50	-120.00
Calcium Carbonate			
Atomite (c.l.)	ton	——	- 30.00
B.I. White No. 1 (c.l.)	ton	——	- 7.50
B.I. White No. 2 (c.l.)	ton	——	- 7.00
B.I. White No. 390 (c.l.)	ton	——	- 5.75
Blue-Star XX	ton	——	- 15.00
Calcene T	ton	45.00	- 55.00
Camelwite	ton	——	- 30.00
Kalite (c.l.)	ton	——	- 40.00
Lesamite (c.l.)	ton	——	- 27.50
Lim-Cal (c.l.)	ton	——	- 12.50
Millical (c.l.)	ton	——	- 27.50
Multifex	ton	——	-105.00
Sierracal	ton	15.00	- 18.50
Super Multifex	ton	——	-145.00
Suspenso (c.l.)	ton	——	- 22.00
Swansdown (c.l.)	ton	——	- 20.00
Witcarb R (c.l.)	ton	——	-105.00
R-12 (c.l.)	ton	40.00	- 60.00
York White	ton	——	- 9.00
Calcium Silicate			
Silene EF	ton	110.00	-120.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	——	- 18.00
Calcium Sulfate, Hydrous			
Crysta-Cal (c.l.)	ton	——	- 12.50
Terra Alba No. 1	ton	12.00	- 14.40
Chalk Whiting (l.c.l.)	lb.	.0150	- .0175
Recco Paris Whiting	ton	——	- 28.00
Clay			
Alsilite (c.l.)	ton	14.00	- 22.50
Alsite (c.l.)	ton	——	- 14.00
Aluminum Flake	ton	16.50	- 36.00
A.S.P. No. 1 (c.l.)	ton	——	- 35.00
No. 11 (c.l.)	ton	——	- 40.00
Buca (c.l.)	ton	——	- 45.00
Burgess No. 20	ton	——	- 35.00
No. 30	ton	——	- 37.00
Burgess Iceberg	ton	——	- 50.00
Burgess Polyclay	ton	——	- 45.00
Catalpo (c.l.)	ton	——	- 35.00
Champion	ton	——	- 14.00
C.S.D. (c.l.)	ton	——	- 13.00
Crown	ton	——	- 14.00
Dixie (c.l.)	ton	——	- 14.00
Hi-White R	ton	15.00	- 33.00
Hydratex R	ton	30.00	- 50.00
Kaolloid Clay (c.l.)	ton	——	- 10.50
Markham (c.l.)	ton	14.00	- 33.80
McNamee (c.l.)	ton	——	- 13.50
Oldham (c.l.)	ton	——	- 13.00
Paragon	ton	13.50	- 34.50
Pigment 33	ton	——	- 37.00
Recco (c.l.)	ton	——	- 14.00
Stellar-R	ton	——	- 50.00
Suprex	ton	14.00	- 35.00
Upton	ton	19.50	- 21.50
Whitetex (c.l.)	ton	——	- 50.00
Witco No. 1 (c.l.)	ton	13.00	- 33.00
No. 2 (c.l.)	ton	13.00	- 33.00
Diatomaceous Earth	ton	30.00	- 50.00
Kaylorite (c.l.)	ton	——	- 30.00
Dolomite (c.l.)	ton	11.00	- 12.00
Flock			
Cotton, white and colored	lb.	.10	- .20
Filfloc F 40-9000	lb.	——	- .16
Filfloc F 6000	lb.	——	- .22
Rayon, bleached or dyed	lb.	.81	- 1.50
Rayon, grey	lb.	——	- .18
Rayon, pink	lb.	——	- .14
Solka-Floc (l.c.l.)	lb.	.05	- .15
Wool, bleached or dyed	lb.	.70	- 1.00
Glue, Bone (dlvd.)	lb.	.16½	- .18½
Graphite	lb.	.05	- .20
Ground Glass (l.c.l.)	lb.	.04	- .06
Leather, Shredded	lb.	.05	- .17
Lignin	lb.	.03	- .06
Indulin	lb.	——	- .09
Limestone, Pulverized	ton	3.25	- 10.00
Micro Velva	ton	45.00	- 47.00
Velvet Filler, Regular	ton	20.00	- 22.00
Magnesium Carbonate	lb.	.09	- .10
K & M Clearcarb	lb.	.1175	- .1225
Magnesium Oxide	lb.	.05	- .06
Magnesium Silicate	ton	18.00	- 35.00
Airex	ton	22.50	- 23.50
Asbestol	ton	20.00	- 22.00
Blue Star Talc	ton	——	- 23.00
L.S. Silver	ton	23.50	- 25.50
Sierra White	ton	21.25	- 23.25
Mica	lb.	.01¼	- .07¼
Concord	lb.	.0675	- .0750
Micro-Mica	lb.	.06¾	- .07¼
Mineralite (c.l.)	ton	25.00	- 40.00
Silversheen	lb.	.06¾	- .07½
Triple A Mica (c.l.)	ton	——	- 25.00
Vermiculite	lb.	.075	- .085
Wet Ground Biotite Mica	lb.	.05½	- .06¼
Wet Ground Mica No. 160	lb.	.06¾	- .07½
Mineral Black			
Keystone 126	ton	15.00	- 20.00

FILLERS (Cont'd)

Pyrophyllite			
Pyrax A (c.l.)	ton	——	- 12.50
WA (c.l.)	ton	——	- 15.00
Silica	ton	16.00	- 27.00
Blue Star	ton	——	- 21.50
Slate, Powdered (l.c.l.)	ton	15.00	- 20.00
Talc, Domestic	ton	9.00	- 20.00
Walnut Shell Flour	ton	38.00	- 80.00
Whiting, Commercial	ton	——	- 12.00
Cameline (c.l.)	ton	8.50	- 10.00
C-C-O White	ton	——	- 17.00
Keystone (c.l.)	ton	——	- 16.00
Rambo No. 1 White	ton	——	- 6.50
No. 6 White	ton	——	- 9.00
Snowflake (c.l.)	ton	——	- 18.00
Veroc (c.l.)	ton	——	- 6.50
Welco (c.l.)	ton	——	- 6.50
York White R (c.l.)	ton	——	- 8.00
Wood Flour	ton	20.00	- 62.18

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	1.05	- 1.35
Black Out	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.65	- .85
VanWax	gal.	1.25	- 1.30

FLAME RETARDANTS

Celluflux	lb.	.36½	- .38½
Chlorinated Paraffin	lb.	.10	- .25
Halowax	lb.	.24	- .39
Zinc Borate 3167	lb.	.12	- .12½
Zyrox	lb.	.65	- .79

LUBRICANTS, MOLD

Aquadag	lb.	3.15	- 3.45
Aquarex BBX Conc.	lb.	——	- .78
D	lb.	——	- .76
L Paste	lb.	——	- .85
MDL Paste	lb.	——	- .30
Akro Gel	lb.	——	- .165
Borax, Granular (l.c.l.)	ton	70.00	- 80.00
Colite Concentrate (dms.)	gal.	——	- .90
Concentrex	lb.	——	- .25
D.C. 7 Compound	lb.	6.20	- 6.80
D.C. Emulsion No. 35	lb.	1.84	- 3.50
D.C. Mold Release Fluid	lb.	4.90	- 6.00
Dipex	lb.	.14	- .18
Dri-Lube	lb.	——	- .22
Erlen Mold Lubricant	gal.	1.25	- 1.50
Glydag	lb.	1.30	- 2.00
Hawkeye Flake (dlvd.)	lb.	——	- .15
Kokobace	lb.	——	- .12
Latex-Lube (dlvd.)	lb.	——	- .20½
Liqui-Lube (dlvd.)	lb.	——	- .15¾
Lubrex	lb.	.25	- .30
Migralube	lb.	——	- .37
Moldeze No. 1	gal.	——	- 36.00
No. 3	gal.	——	- 7.50
Mold Lubricant No. 72 Conc.	gal.	2.50	- 5.50
No. 735	gal.	1.26	- 2.75
Mold-Slick	lb.	.202	- .215
Orvus WA Paste (dms.)	lb.	——	- .25
Prodag	lb.	.25	- .38
Purity Flake (dlvd.)	lb.	——	- .17
Redotex Flakes (dlvd.)	lb.	.14⅞	- .15½
Powder (dlvd.)	lb.	.15⅜	- .16
Rubber-Flo	gal.	——	- 1.15
Rubber-Glo	gal.	——	- .94
Rusco Mold Paste	lb.	——	- .25
Sericite (l.c.l.)	ton	65.00	- 75.00
Thermalube	lb.	——	- .11
Ulco Mold Soap	lb.	.16	- .29
Werkrite Flakes (dlvd.)	lb.	.09⅞	- .10½
Powder (dlvd.)	lb.	.10⅜	- .11¼

LUBRICANTS, RUBBER

Extrud-o-Lube	gal.	——	- 1.57
G.B. Naphthenic Neutrals	gal.	.12	- .18
Propylene Stearate (drums)	lb.	——	- .40

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.48	- .49
Calcium Stearate	lb.	.39	- .40
Glycerized Lubricant	gal.	——	- 1.25
Polyethylene Glycol	lb.	.25	- .26
Rexanol	lb.	——	- .13
Separex	lb.	——	- .15
Slab-Dip	lb.	——	- .15
Wet-Zinc	lb.	——	- .25
Zinc Stearate	lb.	.40	- .43

MOLD CLEANERS

Actusol (dlvd.)	gal.	——	- 1.45
Metso 99	cwt.	3.75	- 5.40
Granular	cwt.	3.25	- 4.75
Rubber-Sol	gal.	——	- 2.75
Shelblast	ton	80.00	-140.00
Sprex A.C. (dlvd.)	lb.	——	- .15½

PEPTIZING AGENTS

Peptizer P-12	lb.	.84	- .90
RPA 2	lb.	——	- .65
3	lb.	——	- .46
5	lb.	——	- .57

PLASTICIZERS & SOFTENERS

AA (drums)	lb.	——	- .22
Acto 500	lb.	——	- .09
Adipol BCA (dms.)	lb.	.44½	- .45
2EH	lb.	.47	- .47½
10A	lb.	.47	- .47½

PLASTICIZERS & SOFTENERS (Cont'd)

Amalgamator Z-4	lb.	——	- .30
American Pine Tar	lb.	.0350	- .0473
Arneel	lb.	.29	- .34
Arolene 1980 (c.l.)	lb.	——	- .10
2286	lb.	——	- .25
Bardol	lb.	.02½	- .03½
B	lb.	.05½	- .05¾
Bayol D	gal.	——	- .382
F	gal.	——	- .52
Beeswax, Refined & Bleached	lb.	.64	- .74
Yellow Refined	lb.	.63½	- .68
Bondogen	lb.	.55	- .60
B.R.C. No. 20	lb.	.0125	- .0135
B.R.H. 2	lb.	.02	- .029
BRS 700	lb.	.0175	- .026
B.R.T. 3	lb.	.024	- .025
4	lb.	.0225	- .0235
7	lb.	.0265	- .0275
B.R.V.	lb.	.0325	- .049
Bunarex Resins	lb.	.06	- .0750
Bunatak M	lb.	——	- .20
O	lb.	——	- .18
R	lb.	——	- .14
U	lb.	——	- .15
No. 21	lb.	——	- .08
No. 90	lb.	——	- .08
No. 865	lb.	——	- .17
No. 1080	lb.	——	- .09½
Burgundy Pitch	lb.	.1026	- .105
Butac	lb.	.11	- .12
Butoxyethyl Diglycol Carbonate	lb.	.40	- .41
Butyl Benzyl Sebacate	lb.	.52	- .54½
Butyl Carbitol Perlargonate (dms.)	lb.	——	- .64
Butyl Cellosolve Perlargonate (dms.)	lb.	——	- .68
Butyl Palmitate	lb.	——	- .26½
Butyl Roleate	lb.	.176	- .18
Butyl Stearate-Tech. (dms.)	lb.	.27	- .29½
CP (dms.)	lb.	.29½	- .42
BWH-1	lb.	——	- .14
Califlux 510, 550	lb.	.025	- .0325
G.P.	lb.	.0125	- .02
R-100	lb.	.05	- .0575
TT	lb.	.02	- .02¾
Campol (t.c.)	ton	——	- 42.00
Candelilla Wax Prime	lb.	.67	- .75
Capryl Benzyl Sebacate	lb.	.59½	- .62
Carbonex	lb.	.0325	- .0375
S Flakes	lb.	.0475	- .0525
S Plastic	lb.	.046	- .051
644	lb.	.0375	- .0425
Carbowax 4000 (drums)	lb.	.31	- .32
Cardolite 615	lb.	.37	- .40
816	lb.	.25½	- .28½
5858	lb.	.42	- .46
Carnauba Wax, Crude	lb.	.73	- .82
Refined	lb.	.81	- .85
Substitute	lb.	.45	- 1.08
Yellow	lb.	1.15	- 1.20
Celluflex	lb.	.36½	- .38½
Ceresine Wax	lb.	.14	- .26
Contogum	lb.	.06¾	- .10¼
Cumar Resins	lb.	.05½	- .14½
D.C. 200 Fluid	lb.	5.20	- 6.00
D.B.M.	lb.	——	- .30
Degras, Common	lb.	.12	- .14
Diamylphenol (l.c.l., dms.)	lb.	——	- .28
Dibenzyl Sebacate	lb.	.65	- .67½
Dibutoxethyl Sebacate	lb.	——	- .5634
Dibutyl Phthalate	lb.	——	- .32
Dibutyl Sebacate—Tech.	lb.	.47½	- .50
C.P.	lb.	.49½	- .52
Dicapryl Adipate	lb.	.41	- .43½
Dicapryl Phthalate	lb.	.38½	- .41
Dicapryl Sebacate	lb.	.53	- .55½
Di-Carbitol Phthalate (dms.)	lb.	.43½	- .44
Dicyclohexyl Phthalate	lb.	——	- .43
Dielex	lb.	.0625	- .0650
Diethyl Phthalate (t.c.)	lb.	——	- .32
Dihexyl Adipate	lb.	.32½	- .35
Dihexyl Phthalate	lb.	.29	- .31½
Dihexyl Sebacate	lb.	.41	- .43½
Di Isobutyl Azelate (dms.)	lb.	——	- .715
Di-iso-octyl Adipate (dms.)	lb.	.42	- .44½
Dimethyl Phthalate	lb.	——	- .22
Dimethyl Sebacate	lb.	.68	- .70½
Dinopol (dms.)	lb.	.523	- .533
Dioctyl Phthalate (dms.)	lb.	.44½	- .45½
Dioctyl Sebacate (dms.)	lb.	.54	- .56½
D.I.O.P. (dms.)	lb.	.40	- .45½
Dipolymer Oil	gal.	.33	- .38
Dispersing Oil No. 10	lb.	.0525	- .055
Dutrex A (B, 5, 6)	lb.	.02½	- .03¾
15	gal.	.10	- .189
20, 21, 25	lb.	——	- .03
Elastex 10-P	lb.	.40	- .42½
50-B	lb.	.34½	- .37
DCHP	lb.	.42½	- .43½
Estac	lb.	——	- .16
Ethox (dms.)	lb.	.44½	- .45
Flexol B-400	lb.	.28½	- .29
DOP	lb.	.42½	- .43½
TOF	lb.	.48½	- .49
3GH	lb.	.43½	- .44
3GO	lb.	.53	- .53½
4GO	lb.	.37½	- .38
8N8	lb.	.39	- .39½
Galex W-100	lb.	.13½	- .15
G. B. Light Process Oil	lb.	.025	- .0325
Harflex 500 (dmsg.)	lb.	.34	- .36½
Hercoyln (dlvd.)	lb.	.1675	- .1725
Herron-H.T.	gal.	.2400	- .2700
Herron-Plas	lb.	.0350	- .0375

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   - Toughness
   - Abrasion
   - Heat Resistance
   - Mechanical Properties

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PLASTICIZERS & SOFTENERS (Cont'd)

Herron-Wax	lb.	.0500	.0550
HT-300	lb.	.45¾	.53
Indonex 632½ (633⅛, 634½, 638⅛)	gal.	.1200	.1700
Indopol H-300 (bbls.)	gal.	1.28	1.32
JMH	lb.	—	.85
Kapsol	lb.	—	.42
KP 23 (dms.)	lb.	.39½	.40
70 (dms.)	lb.	.41	.41½
120 (dms.)	lb.	—	.40
140 (dms.)	lb.	.49½	.50
150 (dms.)	lb.	.41½	.42
201	lb.	—	.43
Kronisol (drums)	lb.	.41	.41½
Kronitex (drums)	lb.	.38	.38½
Lanolin, Tech. Anhydrous	lb.	.16	.18
Lead Oleate	lb.	.16½	.42
Lindol	lb.	.37	.38½
2-Mercaptoethanol (drums)	lb.	—	.75
Methox (dms.)	lb.	.41	.41½
Methyl Laurate	lb.	.25	.27
Methyl Oleate	lb.	—	.20
Methyl Stearate	lb.	—	.70
Monoplex DBS	lb.	.58	.59
Monoplex DCP	lb.	.40½	.41
Monoplex DOS	lb.	.69	.70
5 (dms.)	lb.	.70	.71
11 (dms.)	lb.	.50	.51
16 (dms.)	lb.	.45	.46
Montan Substitute No. 506	lb.	.32	.33
Montan Wax, Crude	lb.	.30	.35
Montan Wax (c.l.)	lb.	.52	.55
Monty Wax	lb.	—	.35
Natac	lb.	.1050	.1150
Neolene 210 (t.c.)	lb.	—	.16
212 (t.c.)	lb.	—	.14
220 (t.c.)	lb.	—	.15
Nerium	lb.	—	.09
Nevillac Resins (dms.)	lb.	.23	.45
Neville Resins (dms.)	lb.	.10½	.15½
Nevindene Resins (dms.)	lb.	.12½	.15½
Nevinol (dms.)	lb.	—	.17
Nevoll	lb.	.0325	.0425
Nevtex 10 (dms.)	lb.	—	.10½
Nuba 1 (and 2) (dms.)	lb.	—	.04
3X (dms.)	lb.	—	.065
15 (and 30) Oil (dms.)	lb.	—	.24
781 Oil (dms.)	lb.	—	.27
No. 480 Oil Proof Resin	lb.	—	.15
Ohopex Q10 (dms.)	lb.	.44½	.45½
Opalwax	lb.	.37	.38
Ortho-Nitrobiphenyl	lb.	.06	.11
Ozokerite Wax No. 64 White	lb.	.31	.32
Yellow	lb.	.25	.26
P-1 (and 4, 6, 8, 20)	lb.	.29½	.33½
P-75	lb.	.66	.72
Pale 4 (and 1000)	lb.	—	.24
Palm Oil	lb.	—	.11
Paradene Resins (dms.)	lb.	.065	.075
Para Flux (dms.)	gal.	.1875	.1975
2016 (l.c.l.)	gal.	.22	.23
Para Lube (l.c.l.)	lb.	.046	.048
Paraplex G-25	lb.	.76	.77
G-40	lb.	.43	.44
G-50	lb.	.39½	.40½
Parmo	lb.	.06	.13¼
Pepton 22	lb.	.72	.75
PG-16 (drums)	lb.	—	.23¼
Philblast No. 1	gal.	.18	.35
No. 2	gal.	.13	.35
Picco 10 (and 25)	lb.	—	.12
75 (and 100)	lb.	—	.11¼
Rubber Resin 100	lb.	.13¼	.13¾
S.O.S.	gal.	.29	.34
Piccocizer 30	lb.	.05½	.06
Piccolastic A (and B, C, D, E)	lb.	.22	.22¼
F	lb.	.139	.144
Piccolyte S Resins	lb.	.1500	.1575
Piccolyte WW Resins	lb.	.45	.47
Piccoumaron Resins	lb.	.06½	.14¾
Piccovar	lb.	.12	.12½
Piccovol	lb.	.02½	.04
Pictar	gal.	.25	.30
Plas-Blend 360	lb.	.03	.04
Plastac M	lb.	—	.09¾
Plasticizer SC	lb.	.49	.52
Plasticizer VA-1	lb.	—	.40
Plasticizer XP-3	lb.	—	.50
Plastoflex 3	lb.	—	.50
50	lb.	—	.38
J-21	lb.	—	.41
Plastogen	lb.	.07¾	.08
Plastolein 9050	lb.	—	.45
9055	lb.	—	.37
9058	lb.	—	.45
9250	lb.	—	.32
9715	lb.	—	.36
Plastolein X-55 (dms.)	lb.	—	.60
X-148 (dms.)	lb.	—	.70
Pinstone	lb.	.27	.30
Polymel D	lb.	—	.20
Polymel Liquid	gal.	.12	.17
Polymel Resins	lb.	.029	.05
Process Oil C-255	gal.	—	.22
PT 400 Pine tar (600, 800) (t.c., dms.)	gal.	.43½	.45½
Reogen	lb.	.12	.12
465 Resin (drums)	lb.	—	.05½
Resin 731-C	cwt.	—	14.75
Resin C	lb.	.02	.0285
Resinex	lb.	.03¼	.04
L-4	lb.	.02¼	.03

PLASTICIZERS & SOFTENERS (Cont'd)

Ridbo 369 (drums)	lb.	.08	.09
369-F (drums)	lb.	—	.12
Rosin Oil	gal.	.54	1.20
R.P.A. No. 2	lb.	—	.65
No. 3	lb.	—	.46
No. 5	lb.	—	.57
R.S.O. Softening Oil	lb.	.03	.05
Rubberol	lb.	—	.21½
Rubtar	gal.	—	.40
Santicizer B-16	lb.	.50	.57
E-15	lb.	.47	.54
M-17	lb.	.44	.51
No. 140	lb.	.31	.38
Sealol 42	gal.	—	1.10
Softener No. 20	gal.	.09	.25
S.P.C.	lb.	—	.19½
Stanolind Petrolatum	lb.	.037	.081
Wax	lb.	.25	.30
Staybelite Resin (dms.)	lb.	—	.11
Sunny South Burgundy Pitch	cwt.	7.51	7.96
Sunny South Pine Tar	lb.	.0350	.0473
Sunny South Rosin Oil	gal.	.47	.49
Superla Wax	lb.	.25	.30
Syncera Wax	lb.	.175	.225
Synplasticizer	lb.	—	.10
Syn Tac (c.l.)	gal.	—	.33
Tar, Refined	gal.	.12	.17
K-Tarnel NR (t.c.)	lb.	—	.0851
Terpene A	gal.	—	.65
TP-90B	lb.	—	.65
TP-95	lb.	—	.55
TP98	lb.	—	.50
Triacetin	lb.	.34	.45
Tricresyl Phosphate	lb.	.36½	.38½
Turgum S	lb.	.09½	.10½
Vanadiset A	gal.	.13	.20
Vanadiset B, C, D	lb.	.022	.055
Pulverized	lb.	.064	.09
Solution	gal.	.40	.65
Vistac No. 1	gal.	—	1.32
No. 2	gal.	—	1.66
No. 4	gal.	—	1.80
Witresin—Granular	ton	41.00	43.00
Solid	ton	36.00	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	—	.24
Refined (dms.)	lb.	—	.15¾
Castorwax (min. 400 lbs.)	lb.	—	.31
Dutrex 7	lb.	.02½	.03¾
30	gal.	.24	.27
ELA	lb.	—	.80
Heron S.P.O.	lb.	.22	.23
Millrex	lb.	—	.15
Resin No. 510	lb.	.13½	.16½

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾	.21
Agchem SA-9 (to SA-12)	lb.	.65	1.02
Alpha Protein	lb.	.19	.23
Aroostoocrat	lb.	—	.07½
Carob Bean Flour	lb.	.33	.35
Casein	lb.	.28	.35
Ethylene Diamine 68%	lb.	.57	.58
Karaya Gum	lb.	.20	.50
Prosein	lb.	.0575	.0605
Rex Compound No. 2801	lb.	—	.15
Sodium Alginate	lb.	—	1.50
Stablex B	lb.	—	.95
Tragacanth Flakes	lb.	.60	1.35

RECLAIMING AGENTS

Armeers C	lb.	.50	.58
T	lb.	.42	.50
No. 517 H.B. Oil	gal.	.11½	.16½
535	gal.	.22	.27
C-6 Oil (and 28, 32)	gal.	.33	.38
C-10 Oil	gal.	.25	.30
C-33 Oil	gal.	.20	.25
Caustic Soda—Flake 76% (c.l., drums)	cwt.	—	3.45
Liquid 50% (t.c.)	cwt.	—	2.40
Solid 76% (c.l., dms.)	cwt.	2.50	3.05
Cresylic Acid (99-100%)	gal.	1.55	1.69
D-4	gal.	.23	.28
E-5	gal.	.21	.26
G. B. Reclaiming Oil	gal.	.12	.18
Heavy Aromatic Naphtha (t.c.)	gal.	—	.125
LX-77 Reclaiming Solvent	gal.	.18	.24
LX-572 Reclaiming Oil	gal.	.23	.28
Neo-Fat D-242	lb.	.05½	.07¾
PT 67 Light pine oil	gal.	.60	.70
PT 101 Pine tar oil	gal.	.32	.43
PT 150 Pine solvent	gal.	.44	.45
Q Oil	gal.	.246	.296
Reclaiming Oil 1621	lb.	.03	.04
Reclaiming Oil 3186 (t.c.)	gal.	—	.28
Reclaiming Oil 3186-G	gal.	—	.26
Reclaiming Reagent No. 4	lb.	.12	.15
Reclaiming Resin No. 1	gal.	.15	.35
R.P.A. No. 3	lb.	—	.46
Soda Ash (c.l., bags)	cwt.	—	1.40
Solvent 534	gal.	.22	.27
Solvent Oil 21	gal.	.24	.29
C-42	gal.	.27	.32
Union Solvent 4060-O	gal.	—	.199
X-1 Resinous Oil	lb.	.0175	.0250
X-60 Solvent	gal.	.24	.32

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0690	.1175
Continental F	lb.	.0690	.1125
Croflex	lb.	.0690	.1125
Crow	lb.	.0690	.1125
Dixiedensed (and S)	lb.	.0690	.1125
Kosmobile (and S)	lb.	.0690	.1125
Kosmos T	lb.	.0690	.1125
Micronex HPC	lb.	.0690	.1125
Spheron 4	lb.	.0690	.1170
Witco Disperso No. 6	lb.	.0690	.1125

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0690	.1175
Continental A	lb.	.0690	.1125
Croflex TH	lb.	.0690	.1125
Dixie R-1	lb.	.0690	.1125
Dixiedensed HM (and S-66)	lb.	.0690	.1125
Huber Arrow TX	lb.	.0690	.1150
Kosmobile HM (and S-66)	lb.	.0690	.1125
Kosmos M	lb.	.0690	.1125
Micronex Standard	lb.	.0690	.1125
Spheron 6	lb.	.0690	.1170
Texas M	lb.	.0690	.1125
Witco Disperso No. 1	lb.	.0690	.1125

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0690	.1175
Continental AA	lb.	.0690	.1125
Croflex 77	lb.	.0690	.1125
Dixiedensed 77	lb.	.0690	.1125
Kosmobile 77	lb.	.0690	.1125
Micronex W-6	lb.	.0690	.1125
Spheron 9	lb.	.0690	.1170
Texas E	lb.	.0690	.1125
Witco Disperso No. 12	lb.	.0690	.1125
Wyex	lb.	.0690	.1150

Channel, Conductive (CC) (bags)

Dixie 5 dustless	lb.	.0832	.1375
Kosmink dustless	lb.	.0832	.1375
Spheron C	lb.	.1200	.1600
Spheron N	lb.	.2200	.2500
Voltex	lb.	.1500	.1850

Furnace, Fast Extruding (FEF) (bags)

Statex M	lb.	.0550	.0950

Furnace, High Modulus (HMF) (bags)

Continex HMF	lb.	.0500	.0900
Dixie 40	lb.	.0500	.0900
Dixie 50	lb.	.0550	.0950
Kosmos 40	lb.	.0500	.0900
Kosmos 50	lb.	.0550	.0950
Modulex	lb.	.0500	.0900
Philblack A	lb.	.0550	.0950
Statex 93	lb.	.0500	.0900
Sterling L	lb.	.0500	.0900
Sterling SO	lb.	.0550	.0950

Furnace, Reinforcing (RF) (bags)

Dixie 60	lb.	.0740	.1125
Kosmos 60	lb.	.0740	.1125

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0350	.0775
Dixie 20	lb.	.0350	.0775
Essex	lb.	.0350	.0775
Furnex	lb.	.0350	.0775
Gastex	lb.	.0350	.0775
Kosmos 20	lb.	.0350	.0775
Pelletex	lb.	.0350	.0775
Seminex	lb.	.0350	.0775
Sterling NS	lb.	.0350	.0775
Sterling R	lb.	.0350	.0775
Sterling S	lb.	.0350	.0775

Furnace, Fine (FF) (bags)

Statex B	lb.	.0575	.0975
Sterling 99	lb.	.0650	.1050
Sterling 105	lb.	.1200	.1600

Furnace, High Abrasion (HAF) (bags)

Philblack O	lb.	.0745	.1145
Vulcan 1	lb.	.0740	.1170
3	lb.	.0740	.1170

Furnace, Very Fine (VFF) (bags)

Statex K	lb.	.0740	.1125

Thermal, Fine (FT) bags)

P-33	lb.	—	.0500

Thermal, Medium (MT) (bags)

Thermax (c.l.)	lb.	—	.0300
Thermax, Stainless	lb.	—	.0350

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REINFORCING AGENTS—MISCELLANEOUS

Darex Copoylmer No. 3 (and X34)	lb.	.35	.37
No. X43	lb.	.36	.38
Darex Copolymer Latex No. 3 (and X34)	lb.	.36½	.50
Durez 12687 (and 12707)	lb.	—	.32
Durez 13355	lb.	—	.26
Marbon S and S-1	lb.	.36	.43
Marmix	lb.	.36	.43
Pliolite S6 Resin	lb.	.36	.37
G Masterbatch	lb.	.35	.36
G50 Masterbatch	lb.	.35	.36
R Masterbatch	lb.	.38	.39
Polyco 220	lb.	.13	.15

RETARDERS

Dutch Boy Normasal	lb.	—	.41¼
ESEN	lb.	.36	.38
Retarder ASA	lb.	—	.45
Retarder W	lb.	—	.43
Retardex	lb.	—	.51

RUBBER SUBSTITUTES

Mineral Rubber

38	ton	35.00	46.00
Black Diamond	ton	35.00	46.00
Byerlyte	ton	42.50	57.50
Gilsonite, Selects (c.l.)	ton	36.50	37.50
Hard Hydrocarbon (dms.)	ton	44.50	46.50
Herron Flake	ton	48.50	49.50
Mineral Rubber, solid	ton	41.60	43.00
Pioneer	ton	35.00	46.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.30	.38
Brown	lb.	.16	.20
Dispersed	lb.	.27	.44
Neophax	lb.	.18	.36
White	lb.	.1300	.3200

Miscellaneous Rubber Substitutes

G.B. Asphaltenes	lb.	.06	.06½
Gilsowax	lb.	.04½	.05
Insulac	lb.	.06	.06½
Resin No. 1098 (drums)	lb.	—	.65
No. 1198	lb.	.31	.35

SOLVENTS

Acetone (dlvd.)	lb.	.07½	.09½
American Dipentine	gal.	.20	.36
American Pine Oil	gal.	.45	.56
Amsco Lactol Spirits (t.c.)	gal.	—	.16
Rubber Solvent (t.c.)	gal.	—	.15
Solv A (t.c.)	gal.	—	.22
Solv A-80 (t.c.)	gal.	—	.265
Solv B (t.c.)	gal.	—	.26
Solv B-90 (t.c.)	gal.	—	.29
Solv D (t.c.)	gal.	—	.285
Solv F (t.c.)	gal.	—	.285
Special Napthalite (t.c.)	gal.	—	.15
Textile Spirits (t.c.)	gal.	—	.16
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	—	.08
Aromatic Solvent 40	gal.	—	.199
Benzol 90%	gal.	.17	.24
Butyl Acetate (t.c.)	lb.	—	.175
Butyl Alcohol (t.c.)	lb.	—	.175
Secondary (dlvd.)	lb.	.10	.12
Tertiary (dlvd.)	lb.	.12	.14
Carbon Bisulfide, Tech.	lb.	.05	.08
Carbon Tetrachloride	gal.	—	.80
Cosol 1	gal.	.30	.38
Cosol 2	gal.	.30	.38
Cyclohexane	lb.	.08	.10
Cyclohexanone	lb.	.25	.27 [a]
Diacetone, Pure (dlvd.)	lb.	.12	.14
Dichlorethyl Ether (dms.)	lb.	.165	.17
Formal (dms.)	lb.	.265	.27
Dichloropentane (l.c.l.)	lb.	—	.04½
Dipentene 122 (dms.)	gal.	.35	.36
Ethyl Alcohol (t.c.)	gal.	—	.375
Ethyl Alcohol SD-1 (t.c.)	gal.	—	.43
Ethyl Alcohol SD-2B (t.c.)	gal.	—	.41½
Ethylene Dichloride (drums, dlvd.)	lb.	.08	.09½
Halowax Oil	lb.	.25	.37
Heptanes (t.c.)	gal.	—	.16
Hexalin Cyclohexanol	lb.	.20	.22 [a]
Hexanes (t.c.)	gal.	—	.16
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.31	.34
Ether, Ref. (dlvd.)	lb.	.04½	.06½
Mesityl Oxide (dlvd.)	lb.	.115	.135
Methanol (dms., dlvd.)	gal.	.43	.495
Methyl Acetone, Syn. (drums, dlvd.)	gal.	.615	.65
Methyl n-Amyl Ketone (drums)	lb.	.37	.39

SOLVENTS (Cont'd)

Methyl Ethyl Ketone	lb.	.09	.11
Methyl Isobutyl Ketone (dlvd.)	lb.	.11	.13
N-5 Pentane Mix. (t.c.)	gal.	—	.11½
N-6 Hexanes (t.c.)	gal.	—	.14
N-7 Hexanes (t.c.)	gal.	—	.13
Petrolene (t.c.)	gal.	—	.10½
Picolines, Aplha, Refined	lb.	.75	1.00
Mixed	lb.	—	.45
Proprietary Alcohol (t.c.)	gal.	—	.43½
Pyridine, Refined	lb.	.80	.89
Quinoline	lb.	.50	.60
Rubber Solvent (t.c.)	gal.	—	.15
Rubsol (t.c.)	gal.	—	.08625
Skellysolve B (Hexanes) (t.c.)	gal.	—	.141
C (Heptanes) (t.c.)	gal.	—	.133
E (Octanes) (t.c.)	gal.	—	.155
R (Solvent Naphtha)	gal.	—	.109
Solvenol (dms.)	gal.	—	.36
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100 (t.c.)	gal.	—	.27
150 (t.c.)	gal.	—	.27
Sunny South Dipentene	gal.	.20	.36
Sunny South Pine Oil	gal.	.45	.56
Toluene (drums)	gal.	—	.28
Toluol (t.c.)	gal.	—	.30
Trichlorethane	lb.	.11	.12
Triglycol Dichloride (dms.)	lb.	.519	.59
Tromex	lb.	.078	.083
Union Thinner 1	gal.	—	.149
3	gal.	—	.149
7	gal.	—	.139
X-7 Sp. Heptanes (t.c.)	gal.	—	.11
Xylene (drums)	gal.	—	.30

STABILIZING AGENTS (for Vinyl Resins)

Basic Silicate White Lead	lb.	.1450	.1725
Dutch Boy DS-207	lb.	—	.49¾
Plumb-O-Sil A	lb.	—	.27¼
B	lb.	—	.28¾
Tribase	lb.	—	.23¼
Dythal	lb.	—	.36½
Lead Stearate, Precip.	lb.	.55	.57
Fused	lb.	.60	.62
Lithium Stearate	lb.	.75	.77
Stabelan A	lb.	.55	.65
G Paste	lb.	—	1.00
XL	lb.	.55	.65
Stabilizer V-7939	lb.	—	.60
Stabilizer JCX	lb.	.49	.51
SN	lb.	—	.42
V-1-N	lb.	.44	.50
V-9	lb.	—	.85
Vanstay	lb.	.33	.35

SUN CHECKING AGENTS

Antisol	lb.	.25	.26
Heliozone	lb.	.25	.26
Sunolite	lb.	.23	.24
Sunproof	lb.	.25	.26
Jr.	lb.	.18	.19
Tonox	lb.	.50	.52

TACKIFIERS

Advaresin 100	lb.	.13½	.14
Agchem RC 30	gal.	.65	1.34
Amberol ST-137X	lb.	.33	.33½
Arco 493-49B	lb.	.15	.17
700-25A	lb.	.14	.16
U2-24	lb.	.11	.13
Beckopol 1400 (dlvd.)	lb.	.25½	.26
Dutrex 44	gal.	—	.919
E-310 Resin Emulsion	lb.	—	.14
Galex (drums)	lb.	—	.15
Koresin	lb.	—	.75
Liquid Rubber Flux	lb.	—	.125
Pentalyn Resins (dlvd.)	lb.	.19½	.22½
Resin V	lb.	—	.23¼
Rubtack	lb.	—	.12
Staybelite Esters (dlvd.)	lb.	.2100	.2150
Super-Beckacite No. 1001 (dlvd.)	lb.	.34	.34½
Synthol	lb.	—	.20½
Vistac No. 1	gal.	—	1.32
No. 2	gal.	—	1.66
No. 4	gal.	—	1.80

THICKENERS (FOR LATEX)

Acrysol GS	lb.	.14½	.22
Alcogum A-5	lb.	.10	.12
Betanol (drums)	lb.	—	.70
Emulsorex No. 5	lb.	—	.35
Lecithin	lb.	.12	.17
Polyco 296	lb.	.13	.15
Propylene Laurate (dms.)	lb.	—	.36
Sodium Silicate	cwt.	1.10	2.00

VULCANIZING AGENTS

Selenium

Vandex	lb.	—	2.00

Sulfur

Blackbird	cwt.	—	2.30
Crystex (l.c.l.)	lb.	.19½	.23
Dispersed Sulfur	lb.	—	.09
No. 2	lb.	.10	.15
Devil (c.l.)	cwt.	—	1.75
Insoluble Sulfur 60	lb.	.13	.13½
Spider	cwt.	—	2.30
Star (c.l.)	cwt.	—	2.25
Tire	cwt.	1.75	2.35
Tube (c.l., dlvd.)	cwt.	2.25	2.85

Tellurium

Latex Telloy	lb.	—	2.00
Telloy	lb	—	2.00

Miscellaneous Vulcanizing Agents

VA-3	lb.	.55	.65

WASHING & FINISHING AGENTS

Apcolene (t.c.)	gal.	—	.09½

WETTING AGENTS

Advawet No. 10	lb.	—	.35
No. 15	lb.	—	.18
No. 33	lb.	.40	.43
Aerosol OT 70% Clear	lb.	.80	1.00
Agchem SA-15 (16, 18)	lb.	.17	.29
Alrosol (dms.)	gal.	—	.48
Aquarex D	lb.	—	.76
ME	lb.	—	.92
NS	lb.	—	.60
SMO	lb.	—	.50
Areakap 50	lb.	.30	.38
Dry 100	lb.	.60	.72
Aresket 240	lb.	.30	.38
Dry 300	lb.	.60	.72
Areaklene 375	lb.	.42	.57
Dry 400	lb.	.70	.84
Armacs	lb.	.29	.76
Arquads	lb.	.24	.27
Etho-chemicals	lb.	.34	.80
Lecithin	lb.	.12	.17
Santomerse D	lb.	.43	.65
S	lb.	.12	.25
Sorbit P	lb.	—	.28
Stablex G	lb.	—	.70
Trenamine W-50	lb.	.20	.22
Triton K-60	lb.	.33½	.41
N-100	lb.	.59½	.67
R-100	lb.	.14½	.25
720	lb.	.30½	.38
770	lb.	.21¾	.29¼
Vultamol	lb.	—	.17½

MISCELLANEOUS CHEMICALS

Acto 450 (550-W, 600, 630)	lb.	.109	.145
Agchem SA-17	lb.	—	.29
Aquarex SMO	lb.	—	.50
A.S.T.M. Oil No. 1 (and No. 3)	gal.	1.00	1.15
Copper Inhibitor X-872-L.	lb.	—	1.75
2-Ethylhexanol (dms.)	lb.	.25	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.20½	.21
MODX (tons)	lb.	—	.29½
Para Resin No. 1784	lb.	—	.09¾
No. 2457 (c.l.)	lb.	—	.04
No. 2718 (c.l.)	lb.	—	.04
pHR	lb.	—	2.00
Pigmented Filmite	lb.	—	.16½
Polyvinyl Methyl Ether	lb.	—	1.00
Reference Fluid SR-6	gal.	.85	1.00
SR-10	gal.	.60	.75
Resin No. 1226	lb.	.31½	.36½
Resorcinol	lb.	—	.75
Rio Resin	lb.	.50	.52
Rubber Resin LM-4	lb.	.28	.35
Santocel	lb.	—	.50
Sublac	lb.	.30	.32
Synpep N (drums)	lb.	—	.54
Thiokol LP-2	lb.	—	.90
LP-3	lb.	—	.90
Tysonite	lb.	.21½	.22¾
Vanfre	gal.	2.00	2.50
Vinsol Resin—Lumps	cwt.	—	5.00

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Rubber technologist, chemical engineer, desires technical or technical-supervisory position in Latin America. Especially experienced in all types of hose. Varied experience includes canning, quick freezing, coal tar resins, paint and varnish. Excellent health, sound educational background, some knowledge of Spanish. Address Box 508-P, RUBBER AGE.

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TECHNICAL SALES: Young, progressive and alert individual now employed as Director of Research and Development, seeks position with company manufacturing or merchandising compounding ingredients and chemicals for the rubber and plastics industries. Twelve years experience at home and abroad in research, development, compounding, factory processing, production and some sales. Age 31. Graduate. Address Box 510-P, RUBBER AGE.

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Wide experience in development and production of solvent and latex type adhesives, coated fabrics, plastic products, miscellaneous rubber compounding. Have directed groups on development projects and have managed small plants. Experience in market research, sales to development liaison, and production control. Young, energetic, good health. Now employed. Desires transfer to position with stable organization offering good long range prospects based on hard work, initiative and intelligence. Salary now high but will sacrifice for good prospects. Location immaterial. Available one month's notice. Address Box 514-P, RUBBER AGE.

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SUPERINTENDENT-CHEMIST now employed, desires new connection. Twenty years of broad practical experience manufacturing mechanical and sponge rubber goods in large and small plants. Location in middle or far West desired. Address Box 511-P, RUBBER AGE.

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FACTORY FOREMAN wanted by progressive manufacturer located in Connecticut to supervise the manufacture of rubber and plastic baby pants, crib sheets and rubber sundries. Good salary and wonderful opportunity for a man who is capable. State experience and salary desired in replying. Address Box 504-W, RUBBER AGE.

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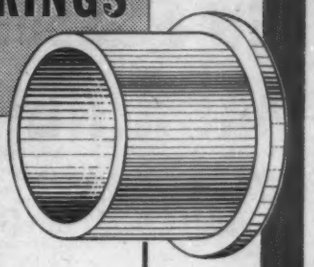

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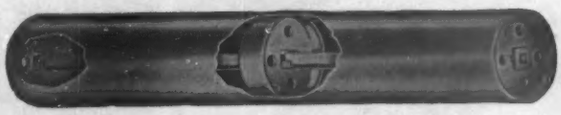

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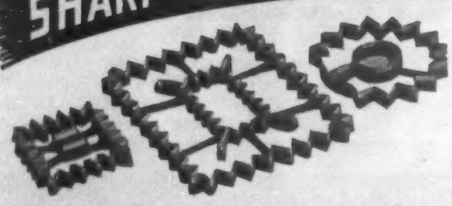

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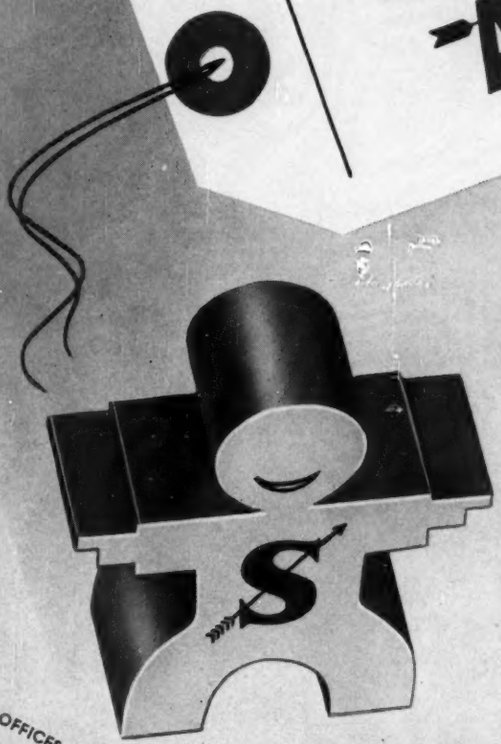

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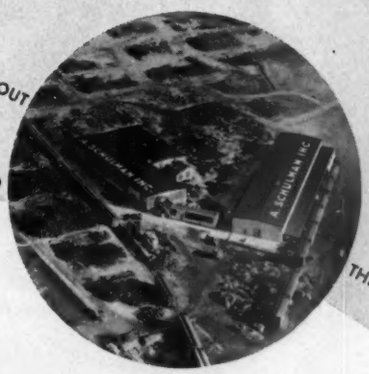

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